# *Soil Survey*

OF

# Langley Municipality and Barnston Island

BY

**H. A. Luttmerding and P. N. Sprout**

## Preliminary Report No. 7

OF THE

## Lower Fraser Valley Soil Survey

MAP REFERENCE:

Soil Map of Langley Municipality and Barnston Island
Scale: 1 inch = 2,000 feet. 1966

**British Columbia Department of Agriculture**
KELOWNA, B. C.

MAY, 1966

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## ACKNOWLEDGEMENT

The classification of soils in the Langley Municipality - Barnston Island areas was undertaken by the Soils Division, British Columbia Department of Agriculture. Aerial photographs used as field sheets were supplied by the Assessment Commission, B. C. Department of Finance. The Air Division, Surveys and Mapping Branch, B. C. Department of Lands, Forests and Water Resources, supplied the required base maps and developed the autopositives from which prints of the soil maps are taken.

Acknowledgement is made to Dr. J. E. Armstrong, Canada Department of Mines and Technical Surveys, for information in regard to surficial deposits, to farmers and Department of Agriculture and municipal officials for general information.

Participating soil survey staff consisted of W. W. Bourgeois, E. W. Witt, L. R. Paynton, F. W. Kopisch-Obuch, B. Brown, G. Head, A. B. Dawson, I Cotic, G. G. Runka, J. Milne, and P. Moran.

Laboratory analyses were undertaken by V. E. Osborne, I. Cotic, and W. W. Bourgeois.

## INTRODUCTION

The soil survey of Langley Municipality was requested by the Assessment Commissioner, B. C. Department of Finance, Victoria. The primary purpose was to continue the evaluation of Lower Fraser Valley soils in relation to rural land assessment; a secondary objective was a soil classification suitable for general use. This report is the latest in a series of surveys of municipalities begun in 1956, eventually to cover the Lower Fraser Valley. To date, interim reports and soil maps have been produced of the municipalities of Pitt Meadows, Delta, Surrey, Chilliwack, Sumas, Matsqui, and Langley.

Field work was begun in 1963 and completed in 1965. Field sheets consisted of 9" × 9" aerial photographs, scale approximately five inches to one mile. A map, "Soil Map of Langley Municipality and Barnston Island", scale 2,000 feet to an inch, was prepared. Hand tinted copies are supplied to government agencies, but others may obtain uncoloured prints at nominal cost from the Department of Agriculture, Victoria. Soil descriptions, climatic and laboratory data are included in this report.

## HOW TO USE A SOIL SURVEY REPORT

Farmers who have lived in a locality for a long time know the soil variations on their farm and on the farms of their immediate neighbours. However, unless they can refer to a soil survey report they cannot compare their soils with those on experimental stations and in other parts of the district where, perhaps, higher yields than those they obtain are reported.

The similarities and differences among soils can be studied after a soil map has been made. When comparisons are possible, new techniques that have proved successful can be transferred to the same soil elsewhere or to closely related soils, with the least chance of failure.

To determine the nature of the soils on any farm or other land, the area should be located on the soil map. Each kind of soil is marked on the map by a distinctive colour and a symbol; i.e., all soils with the same colour and symbol are of the same kind. To find the name of a soil so marked, refer to the map legend. After the soil name has been determined refer to the soil survey report for a description of the soil, including its land use.

The colours on the soil map help to distinguish the soils from one another, and to show the extent of each soil area. Boundaries between soils are transitional and consist of zones varying in width exhibiting characteristics of two or more different soils. Within many soil areas there are spots occupied by other soils which are too small to be separated, or are so intermixed as to be inseparable. Where this occurs the areas are mapped as a "complex" of two or more different soils if the minor soil occupies ten percent or more of the area.

If a general idea of the soils of the whole area is wanted, read the soil descriptions that come under the section, "Description of Soils". Then study the soil map and notice that different groups of soils tend to occur in different localities. These groupings are often associated with differences in the type of farming or land use.

For information regarding history, climate, physiography, water supplies, and social services, the reader should refer to the section entitled, "General Description of the Area".

## GENERAL DESCRIPTION OF THE AREA

### History, Location and Extent (7, 12)

The Hudson's Bay Company, in 1827, founded Fort Langley on the south shore of the Fraser River and established the first permanent British settlement on the lower mainland of British Columbia. Active trade developed, not only in furs, but also in agricultural products (grown on the Hudson's Bay Farm located on Langley Prairie) and manufactured articles. These enterprises flourished until 1858 when it was proven that the Fraser River was navigable to Fort Hope, 78 miles further upstream and established Fort Hope as the new economic terminus. However, Fort Langley was to have one more day of glory. On November 19, 1858, at Fort Langley, Sir James Douglas read a proclamation from the Queen of England establishing the Crown Colony of British Columbia with Fort Langley as the capital. In 1859 the capital was moved to New Westminster and nine years later to Victoria, its present location. The present Municipality of Langley was incorporated in 1873 and the municipal offices are located at Murrayville.

The surveyed area comprises about 81,336 acres of which approximately 1,513 acres are occupied by Barnston Island. The remaining acreage includes Langley Municipality and Langley City. Langley Municipality extends northward from the 49th parallel to the Fraser River and is bounded on the east by Matsqui Municipality, and on the west by Surrey Municipality. Barnston Island is located in the Fraser River to the north of Surrey Municipality.

### Community Facilities, Population and Transportation (7, 11)

Langley Municipality is part of School District No. 35 which includes Langley City. In 1963, twenty-eight schools were located in the school district, with bus service available to most rural children. Children from Barnston Island are transported to schools located in Surrey Municipality. There is good medical and dental service and a modern hospital is available. The R.C.M.P. are in charge of law enforcement. The municipality has been divided into fire districts to provide fire protection services. Swimming pools, a golf course, and other recreational facilities are available.

The main line of the C.N.R. and a railway operated by the B. C. Hydro and Power Authority provide satisfactory rail transportation. Highway No. 401 provides good road access westward to Vancouver and east to the interior. Customs and immigration facilities are provided on the Aldergrove-Bellingham Highway for those wishing to enter or leave the U.S.A. In 1963, the Municipality of Langley maintained 165 miles of paved and 116 miles of gravelled roads providing good access to all parts of the area. The Albion Ferry, operating from Fort Langley, provides transportation to the north shore of the Fraser River.

A ferry also provides access to Barnston Island. Bus transportation east and west is available. Electricity and natural gas are supplied by the B. C. Hydro and Power Authority and telephone and telegraph services are adequate. Langley Municipal Airport provides facilities for private airplanes and rental and charter services are available. Mail facilities are satisfactory with most rural areas receiving daily delivery.

The population of Langley Municipality was 14,585 in 1961 and had increased to an estimated 15,000 by 1963. A more rapid growth is now expected since the completion of Highway No. 401 makes the area easily accessible to people employed in Vancouver, Burnaby and New Westminster but who enjoy living in rural surroundings.

Langley City is the main distributing centre for the municipality and supplies its major commercial needs. More restricted retail outlets are available at Fort Langley and Aldergrove. Minor commercial outlets such as those at Murrayville and Glen Valley which supply automotive services and some grocery requirements are scattered throughout the municipality. Agricultural service and supply establishments are restricted to Langley City, Fort Langley and Aldergrove.

The Municipality of Langley maintained 5.4 miles of water mains in 1963 which supplied the Aldergrove area. The major portion of the municipality receives its water supply from private wells, both artesian and non-artesian. In areas where ground water supplies are limited, residents sometimes have to purchase and haul water for domestic use.

## Physiography and Drainage (13)

Langley Municipality and Barnston Island are part of the Fraser Lowland of southwestern British Columbia, which in turn is part of the Georgia Depression. The Fraser River, occupying a post-glacial valley up to three miles wide and 50 or more feet deep, flows westward along the north boundary of the municipality.

Langley Valley, a former embayment of the sea, separates the two largest upland areas of the municipality. It is relatively flat with elevations from 25 to 50 feet in the center and rising to slightly less than 100 feet along the edges. North of Jardine Station it joins a former meander channel of the Fraser River. The semi-circular channel, about a mile wide, surrounds an approximately one square mile upland area on which Fort Langley is situated. South of Milner the area is drained by the Nicomekl River while the remaining portion is drained northward by the Salmon River.

Clayton Upland, in the northwest quarter of Langley Municipality and extending into Surrey Municipality, is bordered on the south and east by the Langley Valley and on the north and northwest by a lowland area that extends to the Fraser River. The topography is rolling and is 50 to 300 feet above sea level. The majority of the upland is drained northward by several deeply entrenched streams, the most important of which is Yorkson Creek. The slopes bordering the Langley Valley are abrupt and have been modified by wave cutting and later slopewash.

Langley Upland occupies the east and south part of the municipality and is bounded on the north by Glen Valley and the Fraser River, on the northwest by the Langley Valley and on the southwest by the Campbell Upland. The topography is rolling and elevations rise to over 400 feet. Bertrand Creek drains this upland to the south while Campbell River, Anderson and Murray creeks and other tributaries of the Nicomekl and Salmon rivers drain toward the west and northwest. The northern portion is drained into the Fraser River by Nathan and West creeks. An exception to the rolling surface is an area of approximately four square miles located north of the Fraser Valley Highway and bounded by Otter and Livingstone roads which has a flat surface that drops off abruptly on the west side. A tributary of the Salmon River is deeply entrenched through this area.

Campbell Upland, located in the southwest portion of the municipality, has a flat-topped terraced surface from 125 to 150 feet in elevation. Campbell River crosses the southern portion of the upland while the northern portion is traversed by Anderson Creek.

Glen Valley, a lowland area in the northeast corner of the municipality, has elevations below 25 feet with steep valley sides rising to more than 350 feet. The valley is thought to be an earlier meander channel of the Fraser River. Nathan and West creeks, originating on the surrounding uplands, drain across the valley in natural as well as man-made drainage channels.

Barnston Island, a lowland area, is located in the Fraser River to the north of Surrey Municipality. The topography varies from flat to gently undulating and the elevation is less than 25 feet. The island as well as the lowland area at Fort Langley and part of Glen Valley have been dyked against flooding of the Fraser River during freshet season. The remaining portion of Glen Valley is afforded some flood protection by the C.N.R. grade although it is insufficient during periods of greater than usual runoff.

## Climate (5, 10)

The climate is inshore maritime and is strongly influenced by the Coast Mountains which terminate on the north side of the Fraser River. A noteworthy feature is the large number of low pressure systems which move onshore, particularly during the winter. They are much more common than high pressure systems and often follow one another for weeks with hardly a day between.

These numerous low pressure systems bring much rainfall during the winter and, except for recharging ground water reservoirs, are of little benefit. The excessive water raises water tables in many areas to heights sufficient to cause serious drainage problems. Occasionally, polar air masses from the interior of the province drain into the Lower Fraser Valley. Heavy falls of snow or freezing rain, followed by cold weather occur when the cold air from the interior meets the damp maritime air.

The abundance of rainfall during the winter is followed by a deficiency during the summer, particularly during the two important crop growing months of July and August. This condition favours the production of early maturing crops and limits the yield of those which use the whole growing season.

## Temperature

Examination of appended Table A indicates that the annual mean temperatures throughout the Lower Fraser Valley are quite uniform even though the range in monthly mean temperatures tends to widen with increased distance from tidewater. This trend is also evident in the extreme high and low temperatures recorded. Temperatures occurring in Langley Municipality and on Barnston Island are comparable with those recorded at New Westminster, Langley (Lochiel) or Abbotsford (Airport).

## Precipitation

The records indicate wide variation in precipitation during every month, but amounts occurring during the months of May to September inclusive are most important for crop growth. Although total annual precipitation is high, only a small portion, often less than two inches per month, occurs during the five important crop growing months. The following table indicates the percentage of years during which precipitation was less than 2 inches per month for several representative stations:

| Station | May | June | July | August | September | Years of Record |
|---|---|---|---|---|---|---|
| Abbotsford Airport | 17% | 33% | 91% | 58% | 25% | 12 |
| Aldergrove | 30% | 20% | 70% | 50% | 30% | 10 |
| Pitt Meadows | 22% | 11% | 66% | 33% | 11% | 9 |
| Langley Prairie | 30% | 20% | 70% | 40% | 20% | 10 |
| Mission | 40% | 30% | 70% | 40% | 20% | 10 |

Since it is estimated that most crops require at least two inches of water per month during the growing season, it is obvious that a deficiency exists during most years, particularly in July and August.

More detailed precipitation data for various stations in the Fraser Valley are appended in Tables B to F inclusive.

## Frost-Free Period and Length of Growing Season

The longest frost-free periods and growing seasons in Canada exist in the Pacific Coast Area of which the Lower Fraser Valley is part. Appended Table G contains frost data for several stations in the region and indicates the frost-free period varies from about 185 to 200 days. Minor variances exist which can be attributed to local influences such as topography, elevation and distance from large bodies of water.

The length of the growing season is about eight months. Growing season lengths calculated on a base temperature of 42°F, are 228 days with 3,378 degree-days and 243 days with 3,003 degree-days at Chilliwack and Ladner respectively and are typical of the area.

## Snowfall

Table H shows the average monthly and annual snowfall for representative stations in the Lower Fraser Valley and it is evident that snowfall increases with distance from tidewater. In the Langley area, however, only about three inches of total precipitation occurs as snow (ten inches snow = one inch rain).

## Sunshine, Cloud and Wind

Because the area is under the influence of frequent low pressure systems during the winter, cloud cover and overcast is common. High pressure systems with associated clear skies are more frequent during the summer and sunshine is common. In British Columbia, annual hours of sunshine range from 937 at Prince Rupert (Marine Radio) to 2,207 at Victoria (Gonzales). In the Lower Fraser Valley the range is from 1,925 hours at Vancouver Airport to 1,389 at Agassiz. During December, January and February the monthly hours of sunshine are 44, 58 and 89 at Vancouver Airport and 35, 45 and 68 at Agassiz.

A large percentage of east and southeast winds occur during the winter months, whereas west and southwest winds are prevalent during the summer. Wind strength does not vary appreciably from month to month although calm days are infrequent. Storms with winds of hurricane intensity are rare, however, a hurricane was experienced in the fall of 1962.

Taken as a whole, the climate of the Lower Fraser Valley is quite suitable for agricultural production. Temperatures are not extreme, high winds are rare, growing season sunlight hours are adequate and long frost-free periods and growing seasons are present. The main restriction is the summer-dry period which produces moisture deficiencies. However, this problem can be overcome by more extensive use of irrigation.

## AGRICULTURE AND SOIL MANAGEMENT

Langley Municipality and Barnston Island have diversified agricultural production. Dairying constitutes the most important single enterprise and, while carried on throughout the area, dominates in the Fraser floodplain, Langley Valley, and Barnston Island areas. Several well known dairy herds are located here. Small fruits, mainly strawberries, are grown in the vicinity of Hopington and other favourable areas. Several beef feed-lots and farms producing breeding stock are present. A few farms are devoted to breeding and training of race horses or act as riding stables. Poultry and fur farming are important enterprises in some areas. Of lesser importance is vegetable production. At the time of the survey a processing firm was producing pole beans on Barnston Island as well as small amounts of pumpkins and cucumbers. Some corn and potatoes are produced in the vicinity of Milner. Occasional farmers have diversified their operations by raising a few sheep or hogs. Oats, usually cut as green-feed, are often used as a cover crop for new plantings of hay and pasture. Most of the organic soil areas are still unreclaimed: those that are farmed are used for pasture and forage. A peat harvesting plant is active in one peat bog.

Drainage, irrigation, liming, and fertilization all influence soil productivity. A good combination of these management practices is necessary for optimum crop production.

### Drainage

Adequate drainage is necessary for satisfactory crop production. Poor drainage, substantially reducing yields, occurs in large parts of the Fraser floodplain and Langley Valley.

Farmers suffer financial losses due to poor drainage or flooding, which kill crops or reduce yields. Poor drainage restricts root growth, in turn reducing plant vigor since the root system is not sufficient to supply the requirements of above-ground growth. Poor seed germination, uneven maturity and poor quality all result from high water tables; soil aeration and nitrogen availability are also reduced. Calcium, nitrogen and perhaps other plant nutrients are leached from the surface by water table fluctuation.

Farm drainage should be planned for rapid removal of water from the rooting zone, but the water table should be maintained at a level that will aid crop growth. To assess the best height for the water table it is necessary to understand the characteristics of the soil and the requirements of the crops to be grown. Since the rate of removal is related to the rate of infiltration, it is important to know how fast water will infiltrate each kind of soil.

The following is a partial list of crops grown in Langley Municipality and on Barnston Island which require water tables 24 to 30 inches deep.

| Water Table Below 24 Inches | Water Table Below 30 Inches |
|---|---|
| Pasture | Corn |
| Strawberries | Cereals |
| Raspberries (Newburgh variety) | Raspberries |
| Beans | Mangels |
| Cabbage | |
| Potatoes | |
| Most nursery stock | |

Barnston Island and other parts of the Fraser River floodplain are dyked against flooding by the river but during higher than average freshets, areas inside the dykes are flooded by seepage under and through the dykes. During periods of heavy rainfall, ponding often occurs due to the relatively flat topography and the slowly permeable nature of the floodplain soils. Small gradients and slow water movement is typical of streams traversing the floodplain. During heavy runoff they cannot contain the flow and sometimes flood. Inner margins of the floodplains are also subjected to seepage from the surrounding uplands. This seepage is substantial and causes the affected soils to be saturated for long periods.

Although several factors contribute to the poor drainage conditions on much of the Fraser River floodplain, the problem can be greatly reduced by extension and strengthening of the dyking system, improvement and extension of drainage ditches and pumping facilities, and greater use of tile drains. It was noticed during the course of the survey that the efficiency of many ditches was impaired through blockage by vegetation and debris. More attention should be directed to keeping ditches clean.

Large portions of the Langley Valley also suffer from poor drainage. Here the problem is chiefly caused by the flat topography and almost impervious Cloverdale marine sediments. Runoff and infiltration rates are unable to cope with the heavy rainfalls, the result being ponding and saturated soil conditions. More extensive tile draining by individual farmers and cleaner and better ditches would improve the problem greatly.

Other parts of the map-area do not suffer from poor drainage to the extent of the two previously described. Although many poorly drained depressions and seepage slopes exist, especially where the parent materials are glacio-marine, most are an acre or less in size. Some areas can be drained by installation of an open ditch or tile line; others, especially the larger ones, may need a more comprehensive design. Some depressions may be deepened and used for water storage for live stock and limited irrigation.

The Land Clearing Assistance Act, administered by the Provincial Department of Agriculture, was amended in 1959 to provide loans to farmers who wish to install individual farm drainage. Technical advice on drainage systems and their installation is supplied by the Department.

## Irrigation

Irrigation is necessary in a summer-dry climate, regardless of the amount of the total yearly precipitation. The dry summers are responsible for moisture deficiency during the most important growing months. Pastures, for example, generally provide adequate grazing until about the end of June, then decline rapidly during the dry months of July and August.

It is estimated that hay and pasture crops require 15 inches of water during the growing season with 11 inches to be available from July 1 to September 30. The average precipitation at Aldergrove from May 1 to September 30 is about 13.5 inches with about 7.5 inches from July to September inclusive. Though these amounts indicate deficiency, in many years the shortage is actually more severe than indicated. For example, in 1958 the total precipitation from May to September inclusive was 7.7 inches with only 4.6 inches occurring in the period from July to September. Such deficiencies should be insured against by provision for irrigation.

Sources of water for irrigation on the Fraser River floodplain are plentiful. The Fraser River, with a pH of about 7.5, constitutes an abundant source. Other sources of water which can be developed are several streams and the ground water supplies which exist in the sands and gravels under the floodplain.

The Langley Valley is restricted in sources for irrigation water. Dugouts and small streams can supply water for small areas, but for large-scale irrigation, water would probably have to be supplied from outside the area. Most of the domestic water supplies are taken from artesian wells whose flows are generally insufficient for irrigation purposes. Because most of the soils occurring in this area are heavy textured and have high water holding capacities, irrigation is not so critical for the production of satisfactory crops.

On the Campbell Upland and on that part of the Langley Upland which consists of glacial outwash a water table exists within 20 to 50 feet of the surface. By digging wells or dugouts, water supplies sufficient for large-scale irrigation are available. However at the time of the survey (1964), much of the area - the Campbell Upland particularly - was uncleared or uncultivated because of the droughtiness of the soils. The soils in the area are well drained and suited for small fruits and other crops if supplemental irrigation and fertilization are supplied.

On those parts of the Clayton and Langley Uplands which are underlain by glacio-marine sediments the ground water reservoir is in interglacial sands and gravels located at depth. This water is difficult to tap and frequently the flow is insufficient for irrigation purposes. However, in these areas surface and seepage water can be accumulated in dugouts and dammed depressions, and used to irrigate limited areas. Several streams are also available to supply water. Wherever sufficient water supplies are available, the cost of an irrigation system would be well repaid by increased crop yields.

## The Use of Lime and Fertilizers

Lime and fertilizer requirements of different soils and different farms having the same soil, should be determined by the crops grown and the past history and performance of the farm. No standard recommendations are possible because of variations in soils, crops grown and management status of the farms. The amounts and kinds of fertilizers to apply for different crops and soils should be determined by soil tests and discussions with the District Horticulturist or Agriculturist.

It was observed during the course of the survey that a wide range of fertilizers as well as application rates are in use. This indicated a lack of agreement regarding fertilizer practices among the farmers. Some were very pleased with crop results while others were somewhat disappointed.

Manure is widely used and in many cases is the only nutrition the soils receive. Results are usually satisfactory although applications should be heavier, particularly on the upland soils in which the organic matter is quickly depleted. Chicken manure is prized by small fruit growers and many have flocks of poultry to complement their small fruit enterprises.

Response to lime is limited in some cases, but response to nitrogen is generally good. Varying degrees of response, often related to the type of soil and kind of crop, are obtained with phosphorus, potassium and magnesium.

## Land Clearing and Levelling

### a) Lowland

The majority of land levelling on the lowland is restricted to the lateral accretion deposits of the Fraser River. These deposits have sandy substrata and care should be taken to avoid exposing these sands at the surface. These sands, which are low in clay and organic matter, have a low moisture holding capacity and will require heavy applications of fertilizer and manure before satisfactory crop growth is again achieved. To avoid this, topsoil should be removed, the underlying material levelled and the topsoil replaced. When done correctly, levelling eliminates wet spots and leads to more uniform crop maturity.

b) Upland

Great care should be taken when levelling upland soils. As on the lowland, the topsoil should be removed, the land levelled and the topsoil replaced. Initially, this method may be more expensive, but, in the long run, will prove to be more economical than filling depressions with the surface soil and exposing the parent materials on the knolls and ridges. The parent materials, sterile and often impervious, will require incorporation of substantial amounts of organic matter and fertilizer before satisfactory crop growth is regained. Where the parent material is coarse, numerous stones are exposed and water holding capacity greatly reduced.

A considerable acreage suitable for clearing and cultivation still exists in the uplands of Langley Municipality. However, before clearing is undertaken, the expected returns in relation to clearing costs should be considered.

## ORIGIN OF SOIL FORMING MATERIALS (1, 13, 14)

The Municipality of Langley and Barnston Island are entirely underlain by unconsolidated deposits of Pleistocene or Recent age. The term "Pleistocene" refers to that period in the earth's geological history when large areas of the earth's surface were covered periodically by glaciers many thousands of feet thick. This epoch is estimated to have begun about one million years ago and continued in the Langley area to within five to eight thousand years of the present. The term "Recent" refers to the period of time from the Pleistocene to the present. In Langley Municipality the unconsolidated sediments attain a maximum thickness of at least 1,000 feet and in places may be much thicker. The Cloverdale marine sediments alone, in the Milner area, are over 900 feet thick.

The area under discussion is easily divisible into two units which are referred to as lowlands and uplands in this report. The lowlands consist of Glen Valley, Barnston Island, the meander channel around Fort Langley, and a narrow strip of land adjacent to the Fraser River in northwestern Langley Municipality. The remainder of Langley Municipality is considered as uplands.

## Lowland Soil Forming Deposits

These are of post-glacial or Recent origin deposited mainly by the Fraser River and are classified as the Salish Group. This group consists of the following:

### 1) Fraser Floodplain Deposits

These Recent materials, deposited by the Fraser River, are composed of silty clay, silt and sand up to 20 feet thick with sand substrata. Near the inner margins of the floodplain, some vertical accretion occurred by settling of fine textured sediments in quiet, shallow ponds.

Nearer the river, the topography becomes more undulating with parallel ridges and depressions trending with the river flow. The ridges are generally sandy or silty in texture while the associated depressions may be heavier. These lateral accretion deposits occupy the youngest part of the river floodplain and, in places, are still in the process of deposition.

### 2) Swamp Deposits

Swamp or bog deposits overlie much of the inner margins of the floodplain. These deposits, up to 35 feet thick, are usually two to ten feet thick and rest on heavy textured materials. They are very poorly drained due to a combination of seepage and runoff from the surrounding uplands, freshet flooding of the Fraser River and level topography on the bog which restricts surface runoff. Some parts of the peat bogs have a gradual slope from the inner margin toward the river and that part of the bog at the highest elevation is the deepest. Cultivated and partially drained bogs, due to shrinking and settling, tend to be somewhat thinner than those under natural conditions.

### 3) Stream Deposits

Sedimentation from streams meandering across the lowland area form the parent material of some minor soils. These variable textured deposits usually occur as levees along present and abandoned channels of streams originating on the adjacent uplands, and consist of materials eroded from the uplands.

## Upland Soil Forming Deposits

The geological deposits which form the parent materials of the upland soils are older than those of the lowland and are of glacio-marine, marine and glacio-fluvial origin. Raised littoral and beach deposits as well as lag gravels also occur intermittently in the western part of the municipality. The upland deposits, which belong to the Sumas, Capilano and Vashon Groups, are described as follows:

### 1) Abbotsford Outwash

The Abbotsford Outwash, belonging to the Sumas Group, is comprised of glacio-fluvial recessional outwash deposits and some deltaic deposits which consist of sand and gravel up to 125 feet thick. Parts of the area have an aeolian cover which varies from less than six inches to about three feet thick.

Included in the Abbotsford Outwash are ice-contact sand and gravel deposits which contain lenses and pods of glacio-marine and glacial till deposits. Similarly, an aeolian blanket, not more than three feet in depth is identifiable over most parts of the area.

### 2) Whatcom Glacio-Marine Deposits

These deposits, also part of the Sumas Group, are composed of stony silty clay, clay, silt and sand from 25 to 300 feet thick. These glacio-marine deposits are marine drift. Stones and part of the fine material was carried by floating ice, with the remainder transported by meltwater and seawater. The material is identifiable as glacio-marine by the presence of shells and casts of clams and other sea life.

### 3) Sunnyside Sand and Bose Gravel

The Sunnyside sands, consisting of littoral and beach deposits, and the Bose gravels, composed mainly of lag gravels, are part of the Capilano Group.

The deposits, composed of medium to coarse sand and gravel, vary in depth from 2 to 35 feet but generally are less than 5 feet thick. They commonly overlie Cloverdale marine sediments or Newton glacio-marine deposits.

### 4) Cloverdale Marine Sediments

The Cloverdale Sediments, part of the Capilano Group, are marine sediments with textures ranging from silt to clay. These deposits, up to 900 feet deep, were deposited off-shore during the same period as the Sunnyside Sands were being deposited along the marine-shore.

### 5) Newton Glacio-Marine Deposits

These deposits are part of the Vashon Group and are similar in composition to the Whatcom glacio-marine deposits. For the purposes of soil classification, no effort was made to separate soils developed on the two deposits and the same soils have been mapped on both.

In addition to the upland soil forming deposits mentioned in 1) to 5) the Huntingdon Gravels of the Capilano Group are soil parent materials in minor areas. These gravels are usually mantled by the Sumas Group and only occur at the surface where the Sumas materials have been removed by erosion. In scattered depressional areas on the uplands, swamp deposits also occur.

The relationship of the soils to the geological soil forming deposits is shown in Table 1 on pages 16 and 17.

## SOIL MAPPING AND CLASSIFICATION

### Field Methods

The soils of Langley Municipality and Barnston Island were mapped in detail at a scale of about 1,000 feet to the inch. Aerial photographs were used as field sheets and the classification data was plotted upon them. The soils were classified according to the system of the National Soil Survey Committee of Canada, 1965 (21).

Test pits, road and railway cuts and other excavations were used to examine soil profiles, identify and sample them for laboratory analyses and to obtain profile descriptions. The profiles were examined to determine soil texture, structure, consistence, permeability, drainage, colour, horizon sequence, and other observable features. Native vegetation, stoniness, topography, agricultural practices, and other external features were also noted.

Soil boundaries were found and established by bisecting them on roads and ditches and by traverses across fields. Soil colours were identified by the use of the Munsell Colour System.

### Soil Classification

Soils develop from deposits of geologic origin in response to the environment. The kind of soil formed is governed by precipitation, temperature, texture, composition, topography, drainage, vegetation, and other features of the environment and the soil forming deposit. The objective of the soil survey is to identify the different soils and separate them by means of a classification system.

The basic mapping unit is the soil series. A soil series consists of a group of related soils derived from similar parent material and having similar profile and drainage characteristics except for variation of surface texture. Where the surface texture is also uniform, the mapping unit is the soil type. Soil series names are usually place names occurring in the locality where the series was originally classified (e.g., Abbotsford). Soil types are distinguished by the series name followed by the surface texture (e.g., Abbotsford loam).

Table 1 - Classification of Soils and Parent Materials in Langley Municipality and on Barnston Island.

Upland Soils

| Parent Materials | Gleyed Ortstein Podzol | Degraded Acid Brown Wooded | Orthic Acid Brown Wooded | Gleyed Orthic Acid Brown Wooded | Orthic Con-cretionary Brown | Humic Eluviated Gleysol | Rego Humic Gleysol | Rego Gleysol | Muck |
|---|---|---|---|---|---|---|---|---|---|
| Glacio-marine deposits | | | Whatcom | | Nicholson | | Scat | | |
| Marine deposits | | | | Berry | | Langley<br>Cloverdale | | | |
| Raised littoral sands over marine or glacio-marine deposits | Summer | | Sunshine<br>Murrayville | | | | Heron<br>Livingstone | | |
| Lag gravels over glacio-marine deposits | | | Bose | | | | Boosey | | |
| Glacial outwash | Custer | Lynden | Columbia | Defehr | | | Lehman | | |
| Shallow glacial outwash over glacio-marine deposits | | | Aldergrove | | | | Jackman | | |
| Shallow aeolian deposits mixed with or over glacial outwash | | | Marble Hill | | Abbotsford | | | | |
| Shallow aeolian Deposits over ice-contact deposits | | | Peardonville | | | | | | |
| Shallow floodplain deposits over glacial outwash | | | | | | | Cornock | | |

Table 1 - continued

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Stream deposits | | | | | | Ross<br>Carvolth | Sardis | |
| Organic deposits | | | | | | | | Judson |

**Lowland Soils**

| Parent Materials | Orthic Humic Gleysol | Rego Humic Gleysol | Rego Gleysol | Gleyed Mull Regosol | Mull Regosol | Orthic Regosol | Muck | Peat |
|---|---|---|---|---|---|---|---|---|
| Floodplain deposits - lateral accretion | | Hjorth | Page<br>Prest | Fairfield | Monroe | Grevell | | |
| Floodplain deposits - vertical accretion | Hazelwood | | Annis | | | | | |
| Floodplain deposits mixed with or over organic deposits | | Niven | Hallert | | | | | |
| Floodplain deposits mixed with reworked marine deposits | | Katzie<br>Westlang | | | | | | |
| Local stream deposits | | Sim | McElvee<br>Sardis | Bates | Lickman | | | |
| Shallow organic deposits | | | | | | | Banford | |
| Deep organic deposits | | | | | | | Gibson | Triggs |

Phases of a soil series or type may also be distinguished. These are variations within a series or type due to topography, stoniness, drainage, depth of profile or other features which may affect land use.

In cases where it is not feasible to separate two or more soil series because of small areas or intimate intermixing of one soil with another, the area is mapped as a complex. Where the individual series which form the complex have been described, the name of the series occupying the major acreage is listed first, the others following in decreasing order.

The differentiated soil series are classed in subgroups according to their pedologic development; all series in one subgroup have similar profiles. The soil subgroups occurring in the uplands of Langley Municipality, in sequence from maximum to minimum pedologic development, are Gleyed Ortstein Podzol, Degraded Acid Brown Wooded, Orthic Acid Brown Wooded, Gleyed Orthic Acid Brown Wooded, Orthic Concretionary Brown, Humic Eluviated Gleysol, Rego Humic Gleysol, Rego Gleysol, and Muck. A similar sequence for the lowland soils includes Orthic Humic Gleysol, Rego Humic Gleysol, Rego Gleysol, Gleyed Mull Regosol, Mull Regosol, Orthic Regosol, Muck, and Peat.

The above sequences of upland and lowland soils, including the geological materials from which they are derived, are given in Table 1. Short descriptions of the observable characteristics of the pedologic subgroups head more detailed soil descriptions in this report.

## DESCRIPTION OF SOILS

### Upland Soils

### PODZOL SOILS

Podzol soils are well to imperfectly drained mineral soils which have developed under mixed and coniferous forest vegetation. Under virgin conditions they are characterized by organic surface horizons (L-H), a light-coloured eluviated horizon (Ae) more than one inch thick and illuvial horizons (Bhf and/or Bf) of high chroma in which organic matter and sesquioxides are the main accumulation products. Generally, clay translocation and accumulation is not significant and the solum is moderately to strongly acid.

Major development processes involve the accumulation of organic surface layers, the formation and translocation of organo-sesquioxide complexes and their deposition and accumulation in the B horizon, and the decomposition of the clay minerals in the Ae horizon.

In the Langley area, only the Gleyed Ortstein Podzol subgroup was differentiated.

## Gleyed Ortstein Podzol Soils

This subgroup consists of imperfectly drained mineral soils which, under virgin conditions, have organic surface horizons (L-H), a light coloured eluviated horizon (Ae) and cemented or indurated Bfhc or Bfc horizons of rather high chroma. The cemented B horizons may be discontinuous or interrupted. They generally, but not always, lie immediately below the Ae horizon. Gleying and mottling occurs in the B and C horizons.

The Summer and Custer series were classified as Gleyed Ortstein Podzols.

### Summer Series

The Summer series occupies a minor acreage in the Langley Valley and on the Clayton Upland. It occurs in imperfectly drained areas at elevations from 30 to 200 feet and is frequently associated with the Sunshine and Heron series. Two hundred and eighty acres were mapped as soil complexes in which the Summer series occupies the dominant acreage.

The topography varies from level to gently sloping and undulating with slopes up to five percent. The parent material consists of deposits of Sunnyside sand which overlie Newton glacio-marine deposits on the Clayton Upland and Cloverdale marine sediments on the Langley Lowland. The usual depth of the sandy overlay varies from 18 to 48 inches although in scattered areas the depth may attain six feet. An occasional gravel is scattered throughout the profile.

Surface and internal drainage is restricted by iron cementation in the Bfhc and Bfcgj horizons and by the impervious underlying deposits. The result is a perched water table after heavy rainfalls. The surface texture is usually fine sandy loam although variation to sandy loam and loam occurs. This is underlain by sand which, in turn, is underlaid by massive materials varying from silty clay loam to heavy clay.

The Summer soils are classified as Gleyed Ortstein Podzols. Acidity in the profile varies from extremely acid at the surface to slightly acid in the heavy textured subsoil. The iron cemented horizons are well developed and effectively restrict root penetration. Forest cover is composed of a heavy stand of second growth cedar, spruce, cottonwood, alder, and vine maple with an understory of fern, wild lilies of the valley and moss. Clearings mainly support blackberry, hardhack and some mountain ash.

An undisturbed profile of the Summer series, located approximately one-quarter mile southeast of the Norris-Carvolth roads intersection was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | 1 - 0 | Raw to well decomposed mixture of deciduous and coniferous forest litter. pH 4.4. |
| Ahe | 0 - 5 | Gray to dark-gray (10YR 4.5/2, dry) or very dark gray (10YR 3/1, moist) fine sandy loam. Weak, fine subangular blocky structure. Very friable when moist. Abundant roots. pH 4.2.<br>Clear boundary: |
| Ae | 5 - 9 | Gray (10YR 5/1, dry) or gray to brown (10YR 5/1 - 7.5YR 5/2, moist) loamy sand. Weak, fine subangular blocky structure breaking to single-grained. Very friable when moist. Common roots. pH 4.8.<br>Abrupt boundary: |
| Bfhc | 9 -13 | Brown to dark-brown (7.5YR 4/4, dry) or very dusky red (2.5YR 2/2, moist) sandy loam. Strongly iron cemented to indurated. Breaks into sharp fragments which are extremely hard when dry and very to extremely firm when moist. Very slowly permeable to water. Occasional fine roots. pH 5.3.<br>Clear boundary: |
| Bfcg$\bar{j}$ | 13 -22 | Yellowish-brown (10YR 5/4, dry) or brown to dark-brown (7.5YR 4/2 - 10YR 4/3, moist) loamy sand. Strong, fine to medium subangular blocky iron cemented structure. Few, fine to medium, faint mottles. Very to extremely firm when moist. Occasional roots in upper part. pH 5.5.<br>Gradual boundary: |
| CB | 22 -28 | Olive-gray (5Y 4/2, moist) fine sand. Weak, fine to medium, subangular blocky structure breaking to single-grained. Scattered, dark olive gray to black (5Y 2.5/2, moist) cemented patches which are very firm to extremely firm when moist. Common, medium, prominent, reddish-brown (5YR 4.5/4, moist) mottles. Loose to very friable when moist. pH 5.6.<br>Gradual boundary: |
| Cg | 28 -38 | Grayish-brown to olive (2.5Y 5/2 - 5Y 5/2, moist) loamy fine sand. Weak, medium, psuedo-subangular blocky structure breaking to single-grained. Common to many, medium, prominent, |

| Horizon | Depth Inches | Description |
|---|---|---|
| | | reddish-brown to yellowish-red (5YR 4/5, moist) mottles. Very friable when moist. pH 5.8.<br>Abrupt to clear boundary: |
| IICg1 | 38 -46 | Gray (5Y 4/1, moist) clay. Massive. Many, medium, prominent, brown to strong-brown (7.5YR 4/4-5/6, moist) mottles. Firm when moist. pH 5.9.<br>Diffuse boundary: |
| IICg2 | 46 + | Gray (5Y 5.5/1, moist) clay. Massive. Common, medium, prominent, reddish-brown to yellowish-red (5YR 5/5, moist) mottles. Very firm when moist. pH 6.2. |

## Land Use

The areas that are presently cleared are being used for pasture and forage production. Growth is restricted because of shallow rooting depth, high fluctuating water tables, low pH, and low fertility. These soils can be improved by subsoiling to break up the iron cemented horizons, thereby improving permeability and increasing the depth of the rooting zone. Additions of lime and fertilizer are required to improve the pH and fertility status and drainage installation is needed to control the water table during the winter months.

The water holding capacity of the upper profile is low and irrigation during dry periods in the summer is beneficial.

## Custer Series

The Custer soils occupy small, scattered areas throughout Langley Municipality between elevations of 50 and 300 feet. These imperfectly drained soils are usually associated with the Lehman and Defehr series. The topography varies from slightly depressional to very gently sloping with slopes up to three percent. Seventy-two acres of Custer sandy loam were mapped.

The parent material of this soil consists of shallow aeolian and/or slopewash materials overlying and intermixed with glacial outwash consisting of stratified gravels, cobbles and sand up to 125 feet thick. Surface textures, usually sandy loam or loam, occasionally vary to silt loam. In a few areas, scattered gravels and cobbles are found in the surface horizon. Gravel content increases with depth and textures become coarser.

The Custer series is classified as a Gleyed Ortstein Podzol and developed in areas subject to seepage and in imperfectly drained depressions with fluctuating water tables. The surface is very strongly acid and becomes medium acid with depth. Organic matter concentration has occurred in the surface with iron cementation and gleying in the subsoil. Forest cover is mainly deciduous consisting of alder, willow, birch, cottonwood, vine maple with some lodgepole pine, cedar, hemlock, and cascara. A typical profile was examined and described in an abandoned field 200 yards southeast of the Otter-Hollywood roads intersection.

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 5 | Gray (10YR 5/1, dry) or very dark gray to dark-gray (10YR 3.5/1, moist) loam or silt loam. Weak to moderate, medium subangular blocky structure. Friable when moist. Abundant roots. pH 4.9.<br>Clear boundary: |
| Ae | 5 -11 | Light-gray to gray (10YR 6/1, dry) or dark-gray to gray (10YR 4.5/1, moist) loam or silt loam. Weak, medium, subangular blocky structure. Few, fine, faint mottles. Friable when moist. Abundant roots. pH 5.2.<br>Clear boundary: |
| IIBfc | 11 -20 | Brown (10YR 5/3, dry) or dark yellowish brown to yellowish-red (5YR 3/3-4/6, moist) coarse gravelly sand. Strong, medium, subangular blocky, iron cemented structure. Few, fine, faint mottles. Extremely firm when moist. Occasional roots in upper part. pH 5.6.<br>Clear boundary: |
| IIBfcg | 20 -32 | Pale-brown (10YR 6/3, dry) or yellowish-brown (10YR 5/6-5/8, moist) coarse gravel. Strong, medium to coarse, subangular blocky, iron cemented structure. Common, fine to medium, distinct, yellowish-red (5YR 5/6-5/8, moist) mottles. Extremely firm when moist. pH 5.6.<br>Gradual boundary: |
| IICg | 32 + | Coarse sand of variegated colour. Compact, breaking to single-grained when disturbed. Loose when moist. pH 5.7. |

### Land Use

Most of the Custer soils are uncultivated at the present time. Those that are cultivated, support poor growth of hay, pasture and small fruits. A combination of high water tables, restricted rooting depth and low fertility make these soils poor for agricultural production. Subsoiling is required to break up the cemented Bfc horizons to improve permeability and rooting depth. Low pH and fertility should be improved by use of lime and fertilizers, and artificial drainage should be installed to intercept seepage and control the water table. During the dry summer, when the water table recedes below the rooting zone, supplemental irrigation is required to sustain satisfactory crop growth. In some areas, local ground water supplies are available as irrigation water sources.

The underlying gravel and sand are valuable construction materials and may be developed for this purpose.

## ACID BROWN WOODED SOILS

These are soils with moderately to strongly acidic sola and have no distinct eluvial or illuvial horizons. Light coloured eluvial horizons (Ae) up to one inch thick may be present. No distinct mineral-organic (Ah) horizons occur and the upper part of the solum (Bf) is characterized by reddish-brown colour which fades with depth. An organic surface (L-H) horizon is present under native conditions. The parent materials usually have low base status and translocation of sesquioxides and clay is negligible. Drainage varies from well to imperfect. The Degraded, Orthic and Gleyed Orthic subgroups of the Acid Brown Wooded soils were identified in Langley Municipality.

### Degraded Acid Brown Wooded Soils

This subgroup consists of well drained soils, which, under native conditions, are characterized by organic surface horizons (L-H), a light coloured, eluviated horizon (Ae) not more than one inch thick and one or more reddish-brown (Bf) horizons. The Lynden series is the only Degraded Acid Brown Wooded soil found in Langley Municipality.

### Orthic Acid Brown Wooded Soils

Under virgin conditions these soils are characterized by a L-H horizon of forest litter underlain by one or more reddish-brown Bf horizons whose colour fades with depth. The solum is acidic and rather low in base status. These well to moderately well drained soils occupy a large acreage of Langley Municipality and are represented by the Whatcom, Sunshine, Murrayville, Bose, Columbia, Aldergrove, Peardonville, and Marble Hill series.

## Gleyed Orthic Acid Brown Wooded Soils

These imperfectly drained soils have similar characteristics to those of the Orthic subgroup except for gleying and mottling in the lower part of the solum and in the parent material. The Bf horizons are usually duller in colour than in the Orthic subgroup. Representatives of the Gleyed Orthic Brown Wooded subgroup are the Defehr and Berry series.

## Degraded Acid Brown Wooded Soils

### Lynden Series

The major acreage of the Lynden series is located in the southwestern portion of Langley Municipality although scattered areas are located elsewhere. This soil occurs at elevations ranging from 25 to 475 feet with the major acreage located between elevations of 125 to 160 feet. The topography, for the most part, is very gently to gently sloping with gradients up to five percent. One area, however, has slopes ranging to 30%. Hummocky micro-relief caused by the uprooting of large trees is evident in uncleared areas.

This series has developed on glacial outwash deposits which consist of gravels and cobbles interbedded with medium to coarse sand. The surface, which may be gravelly or stony, has a range in texture from gravelly sand to sandy loam. Three hundred and fifteen acres of Lynden gravelly loamy sand, 1,249 acres of loamy sand, 96 acres of gravelly sandy loam,and 1,957 acres of gravelly sandy loam-loamy sand as well as 256 acres of several soil complexes in which the Lynden soils occupy the dominant acreage, were mapped.

The Lynden soils are classified as Degraded Acid Brown Wooded and have variable Ae horizon development not more than one inch thick. The Bf horizon is moderately well developed. In some areas the Ae has been destroyed by uprooting of trees. The solum is rapidly drained although slight temporary restriction to drainage is sometimes caused by weak iron cementation in the lower solum and upper part of the parent material. Tree cover consists mainly of a dense stand of second growth Douglas fir with some scattered cedar. A light ground cover consisting of bracken, red huckleberry, salal, Oregon grape,and moss is also present. An undisturbed profile, examined 200 yards east of the Langley City garbage area, was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | 2 - 0 | Raw to well decomposed coniferous material. Abundant fungus mycelium in lower part. pH 5.1. Abrupt boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Ae | 0 - ½ | Light-gray to light brownish gray (10YR 6/1.5, dry) or grayish-brown (10YR 5/2, moist) loamy sand. Weak, thin platy structure. Very friable when moist. Abundant roots. pH 4.2. Abrupt boundary: |
| Bf1 | ½- 9 | Brown to dark-brown (7.5YR 5/4, dry) or reddish-brown (5YR 4/4, moist) loamy sand. Weak, fine subangular blocky structure. Very friable when moist. Abundant roots. pH 5.6. Gradual boundary: |
| Bf2 | 9 -18 | Yellowish-brown (10YR 5/4, dry) or yellowish-red (5YR 5/6, moist) loamy sand. Weak, fine, subangular blocky structure. Very friable when moist. Common roots. pH 5.9. Gradual boundary: |
| BC | 18 -22 | Pale-brown (10YR 6/3, dry) or yellowish-brown to dark yellowish brown (10YR 4.5/4, moist) gravelly sand. Moderate, coarse subangular blocky structure breaking to single-grained. Scattered patches of weakly iron cemented material. Very friable when moist. Occasional roots. pH 6.0. Clear boundary: |
| C1 | 22 -29 | Gravelly coarse sand of variegated colour. Single-grained. Loose when moist. Occasional roots. pH 6.0. Clear boundary: |
| C2 | 29 + | Medium sand of variegated colour. Single-grained. Loose when moist. pH 6.0. |

## Land Use

Lynden soils are predominantly uncleared or used as building sites. Numerous gravel pits are located in this soil area. Those parts which are cultivated are used for hay, pasture and small fruits. Production, however, is seriously restricted by low moisture holding capacity and low fertility. These soils are well suited to small fruits since they warm early in the spring and have no drainage restrictions, however, irrigation and fertilizer are required for satisfactory yields. In many areas, especially on the Campbell Upland, adequate irrigation water supplies are present in an easily developed ground water reservoir. Areas having serious topographic restrictions or high stone content are best suited for permanent pasture or as building sites.

## Orthic Acid Brown Wooded Soils

### Whatcom Series

These soils, occurring between elevations of 50 and 450 feet, occupy the largest acreage on the uplands of Langley Municipality. The topography is variable, ranging from very gently undulating to rolling and very steeply sloping. Though slopes vary from two to 40 percent, most range from six to 15 percent. One hundred and sixty-one acres of Whatcom loam, 989 acres of Whatcom silt loam, 563 acres of Whatcom: shallow phase as well as 23,551 acres of numerous soil complexes in which the Whatcom soil occupies the dominant acreage were mapped. Most commonly the complexes include the Nicholson and Scat series.

This soil has developed from Whatcom and Newton glacio-marine deposits which are from 25 to 300 feet thick. The textures of these deposits are stony silty clay, silty clay and silt with minor lenses of coarser material. They are roughly stratified to massive, compact, and very slowly permeable. A shallow intermittent aeolian capping occurs in parts of the area. Surface textures are usually silt loam although variations to loam and silty clay loam sometimes occur. The depth of the solum is generally 18 to 30 inches. Areas where the solum is less than 18 inches are mapped as a shallow phase; those where the solum has been removed by land levelling or clearing are designated as an anthropic phase. Stones in the solum occur intermittently throughout the area, especially where the parent materials are Newton glacio-marine deposits.

The Whatcom series, moderately well to well drained, is classified as Orthic Acid Brown Wooded. Minor imperfectly drained areas with Gleyed Orthic Acid Brown Wooded profile development were not separated because of limited areal extent. Permeability of the solum is good but decreases abruptly when the parent material is encountered. Perching of a temporary water table is frequently exhibited by gleying and mottling in the lower solum and upper parent material. Scattered concretions, many soft, occur in the upper solum. The acidity is medium to strong in the upper profile; the parent material is slightly acid or neutral.

The original forest cover, mainly heavy stands of hemlock, cedar and Douglas fir, has largely been destroyed and replaced by dense stands of alder, birch, vine and broadleaf maple. Undergrowth consists of thimbleberry, salmonberry, trailing blackberry, elderberry, wild rose, bracken, and nettles. In some areas, under this deciduous cover, Ah horizons appear to be forming and profile development is trending toward Acid Brown Forest. A typical profile, located in a regrowth area approximately one-half mile east and 100 yards north of the Telegraph Trail-McKay Road intersection, was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-F | ½- 0 | Raw to fermented deciduous litter. pH 4.5. Abrupt boundary: |
| Bhf | 0 - 3 | Dark grayish brown to brown (10YR 4/2.5, dry) or dark-brown (10YR 3/3, moist) silt loam. Weak, medium granular structure. Scattered, hard concretions. Very friable when moist. Abundant roots. pH 5.4. Clear boundary: |
| Bfh | 3 - 9 | Brown to dark-brown (10YR 4/3, dry) or brown to dark-brown (7.5YR 4/2, moist) silt loam. Weak, fine to medium, subangular blocky structure. Scattered, hard concretions. Very friable when moist. Abundant roots. pH 5.0. Clear boundary: |
| Bf1 | 9 -17 | Brown (10YR 5/3, dry) or dark-brown to reddish-brown (7.5YR 4/4 - 5YR 4/4, moist) silt loam. Weak, medium subangular blocky structure. Scattered, hard concretions. Very friable when moist. Common roots. pH 5.1. Gradual boundary: |
| Bf2 | 17 -24 | Yellowish-brown (10YR 5/4, dry) or brown to dark-brown (7.5YR 4/4, moist) silt loam. Weak, medium subangular blocky structure. Scattered, hard concretions. Very friable when moist. Common roots. pH 5.4. Clear boundary: |
| BC | 24 -28 | Yellowish-brown (10YR 5/4, dry) or dark yellowish brown (10YR 4/4, moist) silt loam. Moderate, coarse subangular blocky breaking to moderate, fine subangular blocky structure. Common, medium, faint mottles. Friable to firm when moist. Common to occasional roots. pH 5.5. Clear boundary: |
| Cg1 | 28 -38 | Light brownish gray to light-gray (2.5Y 6/2-7/2, dry) or grayish-brown (2.5Y 5/2, moist) clay loam. Strong, coarse psuedo-blocky structure. Common, medium to coarse, prominent, strong-brown (7.5YR 5/6, moist) mottles. Very firm when moist. pH 6.0. Gradual boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Cg2 | 38 + | Light brownish gray (10YR 6/2, dry) or dark grayish brown (2.5Y 4/2, moist) clay loam or clay. Strong, coarse, psuedo-blocky structure. Common, medium, distinct, brown to dark-brown (7.5YR 4/4, moist) mottles. Common, thin very dark brown (10YR 2/2, moist) coatings on cleavage planes. Extremely firm when moist. pH 6.3. |

### Land Use

At present, most of the cleared acreage of Whatcom soils is utilized for forage and pasture production. Scattered areas are used for small fruits, vegetables and nurseries. Where topography is not extreme, the Whatcom soil is one of the better upland soils in Langley Municipality. It is friable, well drained, generally has a good rooting depth, warms early in the spring, and is moderately fertile. During the latter part of the summer, however, these soils become droughty and supplemental irrigation is beneficial.

Frequently these soils are closely associated with the poorly drained Scat series. Cultivation in early spring and wet periods is difficult because of the numerous wet depressions.

Although suitable for cultivation, large acreages are still uncleared and used for rough pasture. Clearing costs are high due to the dense forest cover. When land clearing, care should be taken not to expose the compact, impervious parent material. Where this has occurred, several years of intensive management with manure, fertilizer and cultivation is required before satisfactory productivity is achieved.

Nitrogen fertilizers generally give good crop responses.

## Sunshine Series

The Sunshine series occupies relatively minor acreages on the western and northern uplands of Langley Municipality between elevations of 50 and 250 feet. Most areas are very gently to gently sloping and undulating with slopes up to five percent although small areas may have slopes up to 10 percent. In forested areas a hummocky micro-relief has been caused by windthrow.

One hundred acres of Sunshine loamy sand, 24 acres of Sunshine sandy loam and 340 acres of Sunshine loamy sand-sandy loam were mapped. An additional 944 acres are included in soil complexes in which the Sunshine soils occupy the dominant acreage. Associated soils are most commonly the Heron and Summer series.

Sunnyside sand, originally littoral or marine beach deposits composed of medium to coarse sand and subsequently uplifted to its present position, forms the parent material. The sand, clean washed and generally free of gravel and cobbles, varies in depth from one to six feet or more and is underlain by Cloverdale marine or Newton glacio-marine sediments. These impervious underlying deposits restrict drainage where the overlying sand is thin. Therefore, the well to moderately well drained Sunshine soils are restricted to areas where the sand is generally three or more feet deep.

The Sunshine soils are classified as Orthic Acid Brown Wooded and have surface textures of sandy loam or loamy sand which grade to sand at variable depths. Reaction varies from medium acid at the surface to slightly acid at depth; the underlying Cloverdale and Newton materials are usually neutral or slightly alkaline. Traces of Ae horizon development are sometimes present in areas which have been undisturbed for long periods.

Native vegetation is composed of dense growth Douglas fir, cedar, scattered hemlock, willow, alder, birch, and cottonwood. A dense understory of bracken, huckleberry, thimbleberry, and other shrubs as well as stumps and old logs are also present.

A profile, examined just north of Stafford Road in Surrey Municipality, was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-F | 1 - 0 | Coniferous forest litter, decomposed in the lower part. pH 4.8.<br>Abrupt boundary: |
| Bf1 | 0 -10 | Dark yellowish brown (10YR 3/4, moist) sandy loam. Weak, medium, subangular blocky structure. Soft when dry, very friable when moist. Abundant roots. pH 5.7.<br>Gradual boundary: |
| Bf2 | 10 -20 | Dark yellowish brown (10YR 4/4, moist) sandy loam. Very weak, medium, subangular blocky structure. Soft when dry, very friable when moist. Abundant roots. pH 5.7.<br>Gradual boundary: |
| Bf3 | 20 -30 | Yellowish-brown (10YR 5/4-5/6, moist) sandy loam or loamy sand. Weak, medium subangular blocky structure. Slightly hard when dry, friable to firm when moist. Common roots. pH 5.8.<br>Abrupt boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| BC | 30 -38 | Yellowish-brown to dark yellowish brown (10YR 4.5/4, moist) medium sand. Massive, breaking to single-grained. Slightly cemented to loose when moist. Occasional mottles. Occasional roots. pH 5.7. |
| Cg | 38 -66 | Light olive brown to olive (2.5Y 5/4 - 5Y 4.5/3, moist) variable textured strata ranging from sand to loam. Dark yellowish brown (10YR 4/4-3/4, moist) mottles. Massive to single-grained. Firm to loose when moist. pH 6.0. |
| C | 66 + | Clean, coarse sand of variegated colours. Single-grained. Loose when moist. pH 6.2. |

### Land Use

A large part of the Sunshine soils are still unreclaimed and under forest vegetation. The cleared areas are mainly utilized for hay and pasture. Urban development is occurring in some areas.

These soils are easy to cultivate and respond well to irrigation and fertilization. In the native state fertility is low, and after reclamation good management is necessary to raise the productivity.

The main limitations are light textures, low moisture holding capacities and low plant nutrient supplies. The solum generally has good structure and provides a deep rooting zone, and is well suited for small fruit production. The soil warms early in the spring and topography is usually not a restriction to cultivation.

Droughtiness and low fertility are the dominant agricultural restrictions on this soil.

## Murrayville Series

The Murrayville series is restricted to the Langley Valley portion of Langley Municipality. It occurs between elevations of 50 to 100 feet and, topographically, is very gently to gently sloping and undulating with slopes up to five percent. Usually this series occurs in association with the Livingstone series which occupies the depressional areas. Murrayville loam occurs on 35 acres and Murrayville silt loam occupies 48 acres. Several soil complexes in which the Murrayville soils occupy the major acreage total 211 acres.

The parent material of the Murrayville series consists of a medium textured shallow capping of marine and slopewash materials over one to five feet of Sunnyside sands which, in turn, overlie Cloverdale marine sediments. Surface textures are usually loam and silt loam although variation to fine sandy loam also occurs.

Murrayville soils are moderately well drained with variations to well or imperfect drainage in small areas. A temporary water table perches on the impervious Cloverdale sediments. The above variations in drainage depend on the thickness of the sandy overlay.

These soils, although having some of the characteristics of Brunisolic Gray Wooded soils, have been tentatively classified as Orthic Acid Brown Wooded. A few, fine, soft concretions sometimes occur in the upper solum. This soil originally developed under dominantly coniferous coastal forest, now almost all removed. A profile, located near the Springbrook Road extention, was examined in a rough cleared field supporting alder, cottonwood, vine maple, occasional cedar, blackberry, bracken, Canada thistle, stinging nettles, elderberry, and various grasses, and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Bf1 | 0 - 6 | Strong-brown (7.5YR 5/6, dry) or dark reddish brown (5YR 3/3.5, moist) loam. Weak, fine, subangular blocky structure. Few, fine, soft concretions. Very friable when moist. Abundant roots. pH 5.5.<br>Gradual boundary: |
| Bf2 | 6 -12 | Yellowish-brown to dark yellowish brown (10YR 4.5/4, dry) or brown to dark-brown (7.5YR 4/4, moist) fine sandy loam. Weak, fine, subangular blocky structure. Few, fine concretions. Very friable when moist. Abundant roots. pH 5.9.<br>Gradual boundary: |
| IIBf | 12 -20 | Pale-brown (10YR 6/3, dry) or brown to strong-brown (10YR 4/3 - 7.5YR 4/4, moist) loamy fine sand. Weak, fine, subangular blocky breaking to weak, fine granular structure. Very friable when moist. Abundant roots. pH 5.9.<br>Abrupt boundary: |
| IIIC$\bar{g}$j | 20 -24 | Yellowish-brown to light olive brown (10YR 5/4 - 2.5Y 5/4, moist) clay loam. Moderate to strong, medium to coarse, psuedo-subangular blocky structure. Few, fine, faint mottles. Firm when moist. Abundant roots. pH 5.3.<br>Clear boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| IIICg1 | 24 -29 | Light olive brown (2.5Y 5/4, moist) clay. Strong, medium, psuedo-blocky structure. Few to common, fine, distinct, strong-brown to yellowish-brown (7.5YR 5/6 - 10YR 5/6, moist) mottles. Very firm when moist. Common roots. pH 5.2.<br>Clear boundary: |
| IIICg2 | 29 -36 | Olive-gray (5Y 4/2, moist) clay. Strong, medium, psuedo-blocky structure. Common to many, fine to medium, prominent, yellowish-red (5YR 5/8, moist) mottles. Very firm when moist. Occasional roots. pH 5.7.<br>Gradual boundary: |
| IIICg3 | 36 -48 | Olive-gray (5Y 4.5/2, moist) clay. Strong, medium, psuedo-blocky structure. Common, fine to medium, distinct to prominent, yellowish-red to yellowish-brown (5YR 5/6 - 10YR 5/6, moist) mottles. Very firm when moist. Occasional roots. pH 7.1.<br>Diffuse boundary: |
| IIICg4 | 48 + | Light olive gray to olive-gray (5Y 6/1-5/2, moist) clay. Strong, coarse, psuedo-blocky structure. Common, medium, prominent, yellowish-red (5YR 5/6-4/6, moist) mottles. Very firm when moist. Occasional roots. pH 7.3. |

## Land Use

Most areas are presently used for hay and pasture production. Some acreage is utilized for oats, often planted as a nurse crop for the grass-clover, hay and pasture mixes. Minor acreages produce potatoes and corn.

Almost the total acreage of the Murrayville soils has been cleared and is being utilized for agricultural production. These soils are friable, relatively flat and have good rooting depths. They become droughty during most summers although moisture deficiencies are not as marked as on the Sunshine soils. Crops which are sensitive to "wet feet" may suffer on the imperfectly drained areas, especially during the wet winter months when the perched water table is high.

A frequent handicap to cultivation and crop production is the closely associated Livingstone soils which occupy poorly drained depressions. The Livingstone soils are often too wet to cultivate when the

Murrayville soils are ready. Although many crops may be grown on the Murrayville series, the range of crops that can actually be grown is often restricted to those suited for the Livingstone series.

## Bose Series

The Bose soils occur west of the Langley Lowland and Campbell River valley. The range in elevation is from 200 to 325 feet. Most of the topography is gently to moderately sloping and undulating with slopes between two to nine percent, but some strongly sloping and rolling areas also are present . Forty-nine acres of Bose series, 167 acres of Bose gravelly sandy loam and 1,047 acres of several soil complexes in which the Bose soils occupy the dominant acreage were mapped.

A mantle of wave-sorted lag gravels up to 10 feet but generally less than three feet thick which overlie Newton glacio-marine deposits form the parent material of the Bose series. The surface textures range from gravelly loamy sand to sandy loam; stone content varies from light to heavy. The solum is slightly acid and, in scattered locations, there is development of a thin Aej horizon.

The Bose series is classified as a well to rapidly drained Orthic Acid Brown Wooded soil. The underlying Newton deposits restrict drainage in the lower part of the solum where mottling indicates perching of a temporary water table. Second growth Douglas fir, alder, maple, birch, and cedar is commonly the native tree cover. The undercover consists of thimbleberry, trailing blackberry, sword and bracken fern, and others. An undisturbed soil profile, examined about 25 yards north of the 49th parallel, 1¼ miles east of the Pacific Highway in Surrey Municipality was given the following description:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | 1 - 0 | Mostly humified forest litter with a thin layer of the last leaf-fall on the surface. |
| Bf1 | 0 - 9 | Brown (10YR 4/4, dry) or dark reddish brown (5YR 3/3, moist) gravelly sandy loam. Very weak, fine to medium granular structure. Moderate amount of cobbles. Very friable when moist. Abundant roots. pH 5.8. Gradual boundary: |
| Bf2 | 9 -24 | Brown (7.5YR 4.5/4, dry) or dark reddish brown (5YR 3/3, moist) gravelly sandy loam. Very weak, fine to medium, granular structure. Occasional cobbles and stones. Very friable when moist. Abundant roots. pH 5.9. Gradual boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| C | 24 -34 | Pale-brown (10YR 6/3, dry) or brown (10YR 4.5/3, moist) gravelly sand. Moderately compacted, breaking to single-grained. Occasional cobbles and stones. Very friable when moist. Occasional roots. pH 6.3.<br>Abrupt boundary: |
| IICgj | 34 -40 | Light-gray (2.5Y 7/2, dry) or olive-gray (5Y 5/2, dry) loam. Massive structure. Few, medium, distinct mottles. Many cobbles and some stones. Friable when moist. Occasional fine roots. pH 5.5.<br>Gradual boundary: |
| IIC | 40 + | Light brownish gray (2.5Y 6/2, dry) or dark grayish brown (2.5Y 4/2, moist) clay loam. Breaks to strong, medium to coarse, psuedo-blocky structure. Dark coatings along cleavage planes. Very firm when moist. pH 6.1. |

### Land Use

Most of the Bose soils are still uncleared or are used as building sites. Cleared areas are used mainly for hay or pasture and, as a general rule, only one hay cut can be expected. Lack of moisture causes pastures to deteriorate rapidly during the summer. These soils are of low value for agriculture because of low fertility status and moisture holding capacity, stoniness, and, in some areas, rough topography. Yields can be improved if irrigation is used, however, sources for water are uncommon. In native conditions, the Bose soils support fairly heavy forest cover and clearing costs are high.

## Columbia Series

The Columbia series occupies substantial acreages throughout the uplands of Langley Municipality and is frequently associated with the Lehman, Abbotsford and Aldergrove series. The topography varies from very gently sloping and undulating to steeply sloping; gradients range from two to 40 percent. The majority of this soil, however, is gently sloping and undulating with slopes from two to five percent. Elevations range from 25 to 300 feet. The Columbia series occupies 3,126 acres of which 2,858 acres were mapped as separate soil types. Another 5,608 acres are mapped as several soil complexes in which Columbia soils occupy the dominant acreage.

The parent material of the Columbia soils consists of sandy and gravelly glacial outwash deposits which are up to 125 feet thick. A very thin veneer of aeolian material and/or wash from higher glacio-marine deposits may be present in some areas; this overlay being mixed into the upper surface of the outwash deposits. Surface textures vary from loam to gravelly loamy sand and, wherever possible, were mapped separately. Surface stone content is variable and is dependent upon the stone content of the parent material. Disturbance from clearing and tree uprooting frequently has brought underlying stones and gravel to the surface.

Drainage is well to rapid in this Orthic Acid Brown Wooded soil, although slight restriction occurs in some areas due to weak iron cementation in the lower solum and upper parent material. In a few areas very weak Aej horizon development occurs. Scattered, soft to hard concretions are present in the upper part of the solum.

At present, uncleared areas support a moderate forest cover of Douglas and grand fir, alder, vine maple, cottonwood, scattered shore pine, and cascara with an understory of thimbleberry, trailing blackberry, wild rose, bracken, salal, and members of the Mahonia species. An undisturbed profile, located 100 yards northeast of the Otter-Roberts roads intersection was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | 1½- 0 | Raw to well decomposed mixture of deciduous and coniferous litter. pH 5.3.<br>Abrupt boundary: |
| Bf1 | 0 - 5 | Brown (10YR 5/3, dry) or dark-brown (7.5YR 3/2, moist) sandy loam. Weak, fine, subangular blocky structure. Few, hard concretions. Very friable when moist. Occasional gravel. Abundant roots. pH 5.7.<br>Clear boundary: |
| Bf2 | 5 -12 | Yellowish-brown (10YR 5/4, dry) or brown to dark-brown (7.5YR 4/4, moist) sandy loam. Weak, fine, subangular blocky structure. Occasional, soft to hard, concretions. Very friable when moist. Occasional gravel. Common roots. pH 5.8.<br>Gradual boundary: |
| Bf3 | 12 -19 | Yellowish-brown (10YR 5/4, dry) or brown to dark-brown (10YR 4/3, moist) loamy sand or sand. Weak, fine to medium, subangular blocky structure. Very friable when moist. Occasional gravel. Common roots. pH 5.8.<br>Gradual boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| BC | 19 -24 | Light yellowish brown (10YR 6/4, dry) or dark yellowish brown (10YR 4/4, moist) medium to fine sand. Weak, medium, subangular blocky structure breaking to single-grained. Scattered, weakly iron cemented patches. Loose when moist. Occasional roots. pH 6.0. Clear boundary: |
| C1 | 24 -30 | Medium to fine sand of variegated colour. Single-grained. Loose when moist. Occasional roots. pH 6.2. Clear boundary: |
| C2 | 30 + | Medium to coarse gravel of variegated colour. Firm in places. Single-grained. Weak iron staining. Loose when moist. Occasional roots in upper part. pH 6.1. |

### Land Use

Because the topography on the Columbia soils is generally favourable and tree cover is less dense, a large acreage is presently cleared.

Under dry farming conditions, these are poor to fair soils. Moisture holding capacity and fertility are low and crops quickly deteriorate from lack of moisture under the heat of the summer. If irrigation and commercial fertilizer are used, satisfactory yields of small fruits, vegetables, hay, and pasture can be expected. Stones are common in some areas and should be removed to improve efficiency of mechanical equipment. Most of the steeply sloping areas are used for rough pasture. The underlying gravels and sand are a good source of construction materials and gravel pits are common. When cultivating these soils, care should be taken not to cultivate deeply thereby bringing up the coarse sands or gravels from underneath.

Under much of the Columbia soils a water table exists at relatively shallow depths, which can be easily developed for irrigation purposes.

## Aldergrove Series

The Aldergrove soils occupy scattered locations throughout the uplands of Langley Municipality and are frequently associated with the Columbia and Whatcom soil series. They occur between elevations of 150 and 300 feet. Topography ranges from very gently sloping and undulating to steeply sloping and undulating with slopes from two to 30 percent. Eighteen acres are classified as Aldergrove series and a further 404 acres as several soil types. Soil complexes in which the Aldergrove soils occupy the major acreage total 1,884 acres.

These soils have developed on shallow glacial outwash sands and gravels that overlay Whatcom glacio-marine deposits and usually occur near the boundary between deep glacial outwash and glacio-marine areas. Often a shallow overlay of aeolian and/or slopewash materials occurs on top of or mixed into the surface of the outwash. The thickness of the glacial outwash varies from one to six feet, but most commonly is two to four feet. Stones are common in the surface where the overlay is gravelly. Surface textures generally are sandy loam or loam but minor areas have textures of loamy sand, gravelly sandy loam and silt loam.

This Orthic Acid Brown Wooded soil is well to moderately well drained. Perching of a temporary water table at the contact between the glacial outwash and glacio-marine material is indicated by some gleying and mottling. Scattered, hard concretions occur in the upper solum.

The original vegetation consisted chiefly of Douglas fir, cedar and hemlock. This has largely been removed by logging and burning and replaced by deciduous cover of alder, vine maple, cottonwood, cascara, and birch, with a dense understory of salmonberry, thimbleberry, bracken, trailing blackberry, stinging nettles, huckleberry, and moss. Where this deciduous cover has been present for long periods, Ah horizon development is indicated. An undisturbed profile located approximately 300 yards northwest of the Brown Road-36A Avenue intersection was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | ½- 0 | Raw to well decomposed deciduous litter.<br>pH 5.6.<br>Abrupt boundary: |
| Ah | 0 - 3 | Brown to dark-brown (7.5YR 4/2, dry) or dark reddish brown (5YR 2.5/2, moist) loam. Weak, fine to medium, granular structure. Few, hard concretions. Occasional gravels and cobbles. Very friable when moist. Abundant roots.<br>pH 5.3.<br>Clear boundary: |
| Bf1 | 3 -10 | Yellowish-brown (10YR 5/4, dry) or dark reddish brown (5YR 3/3, moist) loam. Weak, fine subangular blocky structure. Few, hard concretions. Occasional gravels and cobbles. Very friable when moist. Abundant roots.<br>pH 5.8.<br>Diffuse boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Bf2 | 10 -18 | Yellowish-brown (10YR 5/4, dry) or dark reddish brown (5YR 3/4, moist) gravelly sandy loam or gravelly loam. Weak, fine to medium, subangular blocky structure. Occasional cobbles. Very friable when moist. Abundant roots. pH 5.9. Gradual boundary: |
| IICB | 18 -27 | Light yellowish brown (10YR 6/4, dry) or brown (7.5YR 4/4, moist) gravelly sand or gravelly loamy sand. Single-grained. Scattered, weak iron staining. Loose when moist. Abundant roots in upper part, common in lower part. pH 6.0. Gradual boundary: |
| IIC | 27 -38 | Gravelly sand of variegated colour. Single-grained. Weak iron staining. Loose when moist. Common roots in upper part, occasional in lower part. pH 5.9. Clear boundary: |
| IIICgj1 | 38 -48 | Light brownish gray (2.5Y 6/2, dry) or grayish-brown to olive-gray (2.5Y 5/2 - 5Y 5/2, moist) loam or clay loam. Breaks to strong, medium psuedo-subangular blocky structure. Few, medium, distinct, reddish-brown (5YR 4/4, moist) mottles. Scattered gravel. Very firm when moist. Occasional roots. pH 5.7. Diffuse boundary: |
| IIICgj2 | 48 + | Light brownish gray (2.5Y 6/2, dry) or grayish-brown (2.5Y 5/2, moist) clay loam. Breaks to strong, coarse psuedo-blocky structure. Few, medium, distinct, reddish-brown (5YR 4/4, moist) mottles. Extremely firm when moist. pH 6.0. |

## Land Use

The cleared areas of the Aldergrove series are presently used for hay, pasture and small fruit production. Because these soils often occupy a minor area in complexes with other soils, management practices are frequently suited to the surrounding dominant soils. A substantial acreage of Aldergrove soils, suitable for cultivation, has not yet been cleared.

Water holding capacity is low and drought frequently effects shallow-rooted crops which are not irrigated. More moisture is available to deep-rooted crops able to penetrate to the underlying glacio-marine stratum. Stones are common in areas where the glacial outwash is gravelly. When clearing, care should be taken not to remove the surface soil and thereby expose the coarse outwash. Similarly, cultivation should be relatively shallow to avoid bringing the coarser subsoil to the surface. For maximum production irrigation and fertilization should be practised.

## Marble Hill Series

The Marble Hill series occurs only near the intersection of Brown and McDonald roads and in Glen Valley. The topography is very gently to gently sloping and undulating with slopes from one to five percent; elevations are from 50 to 300 feet. Two hundred and thirty-eight acres of Marble Hill loam-silt loam, 300 acres of Marble Hill silt loam and 655 acres of several soil complexes in which the Marble Hill soils occupy the major acreage were mapped.

The parent material consists of 18 to 36 inches of aeolian and/or slopewash materials derived from the adjacent glacio-marine deposits and is underlain by gravelly and sandy outwash deposits. Surface textures are silt loam or loam with minor inclusions of fine sandy loam; these textures usually remaining constant until the outwash is encountered. Stones are very uncommon in the profile. Scattered concretions occur in the upper part.

The Marble Hill series is a well drained Orthic Acid Brown Wooded soil which developed under coastal coniferous forest. Typical regrowth on uncleared areas consists of scattered cedar and fir, cottonwood, alder, broadleaf, and vine maple with an understory of thimbleberry, salmonberry, trailing blackberry, stinging nettles, elderberry, and bracken. A profile, located one-half mile east and 300 yards north of the Brown-McDonald roads intersection, was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | 1 - 0 | Mixture of raw to well decomposed deciduous and coniferous material. pH 4.7.<br>Abrupt boundary: |
| Bfh | 0 - 5 | Brown to dark-brown (10YR 4/3, dry) or dark reddish brown (5YR 3/3, moist) silt loam. Weak, fine subangular blocky structure. Scattered, fine concretions. Very friable when moist. Abundant roots. pH 5.5.<br>Clear boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Bf1 | 4 -12 | Yellowish-brown (10YR 5/4, dry) or brown to dark-brown (7.5YR 4/4, moist) silt loam. Weak, fine to medium, subangular blocky structure. Scattered concretions. Very friable when moist. Abundant roots. pH 5.6.<br>Gradual boundary: |
| Bf2 | 12 -17 | Yellowish-brown (10YR 5/4, dry) or reddish-brown (5YR 4/4, moist) silt loam. Weak to moderate, fine subangular blocky structure. Very friable when moist. Common roots. pH 5.7.<br>Gradual boundary: |
| CB | 17 -20 | Pale-brown (10YR 6/3, dry) or grayish-brown to brown (2.5Y 5/2 - 10YR 4/3, moist) silt loam. Massive in place, breaking to weak, fine subangular blocky structure when disturbed. Friable when moist. Common roots. pH 5.8.<br>Clear boundary: |
| C | 20 -31 | Light brownish gray (2.5Y 6/2, dry) or grayish-brown to dark grayish brown (2.5Y 4.5/2, moist) silt loam. Massive. Friable when moist. Common roots in upper part, occasional in lower part. pH 5.7.<br>Abrupt boundary: |
| CIIC | 31 -34 | Pale-brown (10YR 6/3, dry) to variegated gravelly sandy loam. Weakly iron cemented patches. Weak, medium psuedo-subangular blocky structure breaking to single-grained. Very friable when moist. Occasional roots. pH 5.7.<br>Abrupt boundary: |
| IIC1 | 34 -48 | Medium sand of variegated colour. Single-grained. Loose when moist. Occasional roots. pH 5.9.<br>Clear boundary: |
| IIC2 | 48 + | Gravelly coarse sand of variegated colour. Single-grained. Loose when moist. pH 5.8. |

## Land Use

Most of the Marble Hill series is cleared and used for small fruit production. A nursery is also partly located on this soil which is one of the best in Langley Municipality for small fruit production. In fact, it is good for a wide range of crops, since it has favourable topography, high water holding capacity and friable, easily cultivated surface. For optimum production, however, supplemental irrigation and fertilization should be practised.

A water table existing in the underlying gravels and sands can often be developed for irrigation purposes.

## Peardonville Series

The Peardonville series occupies a small area in the southeastern corner of Langley Municipality between 175 and 325 feet elevations. The topography varies from gently sloping and undulating to very steeply sloping, with gradients from five to 50 percent. However, the major portion has slopes between nine to 30 percent. Two hundred acres are occupied by Peardonville silt loam-loam and an additional 80 acres are mapped as Peardonville-Columbia soil complex.

The parent material of this soil consists of shallow aeolian deposits underlain by ice-contact deposits. The ice-contact deposits are a heterogeneous mixture of stratified gravel and sands, glacial till and glacio-marine deposits. The aeolian overlay varies in thickness from about 12 inches on the knolls and ridges to over 24 inches in the depressions. Surface textures vary from silt loam to loam; the loam occurring on the ridges. Stone content of the profile is variable, ranging from none at all in the depressions to very stony on the knolls and ridges.

This well drained Orthic Acid Brown Wooded soil originally supported a coastal coniferous forest. This has largely been removed by logging and burning; presently uncleared areas consist of alder, maple, hazelnut, thimbleberry, salmonberry, nettle, bracken, and others in a dense stand. An undisturbed profile about one-half mile north, 200 yards east of the Peardonville-Ross roads junction in Matsqui Municipality was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | 1 - 0 | Leaves, twigs and other organic material; raw to well decomposed. pH 4.7.<br>Abrupt boundary: |
| Bfh | 0 - 6 | Brown (10YR 5/3, dry) or dark yellowish brown (10YR 3/4, moist) silt loam. Weak, fine subangular blocky structure. Scattered concretions. Very friable when moist. Abundant roots. pH 5.4.<br>Clear boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Bf | 6 -12 | Brown (10YR 5/4, dry) or brown to dark-brown (7.5YR 4/4, moist) loam. Weak, fine subangular blocky structure. Scattered concretions. Very friable when moist. Common roots. pH 5.5. Gradual boundary: |
| BIIC | 12 -23 | Light yellowish brown (2.5Y 6/4, dry) or olive-brown (2.5Y 4/4, moist) sandy loam. Moderate, medium subangular blocky structure. Friable when moist. Occasional roots. pH 5.9. Diffuse boundary: |
| IIC1 | 23 -44 | Light brownish gray (2.5Y 6/2, dry) or dark grayish brown to grayish-brown (2.5Y 4/2-5/2, moist) loamy sand. Weak, fine psuedo-subangular blocky structure breaking to single-grained. Contains fragments of sandy loam till. Loose when moist. Occasional roots. pH 6.1. Diffuse boundary: |
| IIC2 | 44 + | Light brownish gray (2.5Y 6/2, dry) or grayish-brown to olive-brown (2.5Y 5/2-4/4, moist) medium sand and fine gravel containing fragments of sandy loam till. Single-grained. Loose when moist. pH 6.2. |

### Land Use

Rough topography limits much of this soil to permanent cover crops, and most of the cleared acreage is used for forage or pasture production. Small acreages having moderate topography may be suitable for small fruits. Variability in depth of the topsoil as well as variance in the subsoil textures causes large differences in water holding capacities and percolation rates. Although areas where the topsoil is relatively deep produce satisfactory crops most years without irrigation, the shallower areas require irrigation. Stone clearing may be required on some knolls and ridges. Care should be taken during land clearing and levelling to avoid exposure of the coarse underlying materials.

## Gleyed Orthic Acid Brown Wooded Soils

### Berry Series

The Berry series is confined to the Langley Lowland and occurs at elevations between 50 and 100 feet. In the Langley Valley it is commonly associated with the Milner and Cloverdale soil series and occupies an intermediate position. The topography is usually gently sloping and undulating with slopes to 5 percent. There are minor variations to steeply sloping land with gradients to 30 percent. A total of 54 acres of Berry series, 356 acres of Berry silt loam and 14 acres of Berry clay loam as well as 1,831 acres of several soil complexes in which the Berry soils predominate were mapped.

The parent material of this soil series is Cloverdale marine sediments. Surface textures are usually silt loam, with variations to silty clay loam and clay loam. Within 18 to 24 inches of the surface, the clayey, impervious marine parent material is encountered. Water movement through the upper solum is moderate, but is severely restricted by the underlying clay which causes perching of a temporary water table, particularly during periods of heavy rainfall.

The Berry series has been tentatively classified as a Gleyed Orthic Acid Brown Wooded. Scattered, fine usually soft concretions occur in the upper solum. Drainage is imperfect with mottling and gleying occurring within 12 to 18 inches of the surface. This soil developed under a coniferous forest, mainly Douglas fir and cedar. Most areas have been cleared, and a profile located in a hay field one-half mile northwest of the Medd-Livingstone roads intersection was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 8 | Brown (7.5YR 5/4, dry) or dark-brown (7.5YR 3/2, moist) silt loam. Moderate, medium, subangular blocky breaking to moderate, medium, granular structure. Scattered, fine concretions. Friable when moist. Abundant roots. pH 6.1.<br>Abrupt boundary: |
| Bf | 8 -13 | Pale-brown (10YR 6/3, dry) or brown to dark-brown (7.5YR 4/4, moist) silt loam. Moderate, medium, subangular blocky structure. Few, fine, faint mottles. Scattered, fine concretions. Friable when moist. Abundant roots. pH 6.2.<br>Clear boundary: |
| Bfg | 13 -19 | Pale-brown (10YR 6/3, dry) or dark yellowish brown (10YR 4/4, moist) clay loam or clay. Moderate, medium to coarse, subangular blocky structure. Common, medium, distinct, strong brown (7.5YR 5/6-5/8, moist) mottles. Firm when moist. Abundant roots in upper part, common in lower part. pH 5.5.<br>Clear boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| CB | 19 -25 | Light brownish gray to grayish-brown (2.5Y 5.5/2, moist) clay loam or clay. Moderate, medium to coarse subangular blocky structure. Common, medium, distinct reddish-yellow (7.5YR 7/6, moist) mottles. Firm when moist. Common roots in upper part, occasional in lower part. pH 5.3.<br>Clear boundary: |
| Cg1 | 25 -31 | Gray to olive-gray (5Y 5/1.5, moist) clay. Moderate, medium to coarse, psuedo-subangular blocky structure, Common, fine, prominent, strong-brown to yellowish-brown (7.5YR 5/6 - 10YR 5/6, moist) mottles. Firm when moist. Occasional roots. pH 6.2.<br>Gradual boundary: |
| Cg2 | 31 -39 | Gray to olive-gray (5Y 5/1.5, moist) clay. Moderate, medium to coarse, psuedo-subangular blocky structure. Common, medium, prominent, dark reddish brown to very dark brown (5YR 2/2 - 10YR 2/2, moist) mottles. Very firm when moist. pH 6.0.<br>Gradual boundary: |
| Cg3 | 39 -47 | Dark grayish brown to gray (2.5Y 4/2 - 5Y 5/1, moist) clay. Moderate to strong, medium to coarse, psuedo-subangular blocky structure caused mainly by concoidal fracturing. Common, medium, distinct, dark yellowish brown (10YR 4/4, moist) mottles. Extremely firm when moist. pH 7.2.<br>Diffuse boundary: |
| Cg4 | 47 + | Dark grayish brown (2.5Y 4/2, moist) clay. Strong, medium to coarse, psuedo-subangular blocky structure caused mainly by concoidal fracturing. Common, medium, distinct, dark yellowish brown (10YR 4/4, moist) mottles. Extremely firm when moist. pH 7.6. |

## Land Use

The majority of the Berry soils are presently cleared and used for pasture and forage production. Yields are generally good although sometimes the clovers are decimated by rather high water tables during the winter. The installation of subsurface drains should eliminate this problem.

Rooting depth is satisfactory, fertility levels are moderate and water holding capacities are good. Topography sometimes is adverse.

The closely associated Berry and Cloverdale series often pose cultivation and cropping problems. The poorly drained Cloverdale series may be too wet for cultivation at the time when the imperfectly drained Berry soils are suitable. Although a wide range of crops is suitable for the Berry series, the crops grown are often restricted to those which also do well on the Cloverdale series.

## Defehr Series

The Defehr series, usually associated with the Columbia and Lehman series, occupies scattered minor areas, mainly in the southern portion of Langley Municipality. The topography ranges from very gently sloping to gently sloping and undulating with slopes of two to five percent. A few slightly depressional areas also occur. Elevations lie between 150 and 250 feet. Twelve acres of the Defehr series and an additional 93 acres of two soil complexes in which the Defehr series occupies the dominant acreage were mapped.

The Defehr series has developed from shallow aeolian or eroded glacio-marine material that overlies sandy and gravelly glacial outwash. The overlay, usually less than 12 inches deep, is frequently mixed with the underlying outwash materials. Surface textures vary from sandy loam to loam with minor areas being gravelly sandy loam or silt loam. Surface stone content is variable, depending on the number in the underlying outwash.

This soil has been classified as a Gleyed Orthic Acid Brown Wooded. It is imperfectly drained and occurs near streams and seepage areas. The water table fluctuates with the seasons, being high in winter and droping thereafter. The native cover is composed of Douglas fir, cedar, hemlock, alder, willow, cottonwood, shrubs, herbs, and ferns. A representative profile, located in a cultivated field about 400 yards east of Columbia Bithiluthic's gravel pit near Ross Road in Matsqui Municipality, was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 7 | Dark grayish brown (10YR 4/2, dry) or dark-brown to dark yellowish brown (10YR 3/3.5, moist) loam. Weak, fine to medium, subangular blocky breaking to weak granular structure. Friable when moist. Scattered stones. Abundant roots. pH 5.3.<br>Abrupt boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Bfhgj | 7 -11 | Brown (10YR 5/3, dry) or yellowish-brown to dark yellowish brown (10YR 4.5/4, moist) gravelly loam. Weak, fine subangular blocky structure. Few, fine, faint mottles. Friable when moist. Scattered stones. Abundant roots. pH 5.9.<br>Clear boundary: |
| Bfg | 11 -17 | Pale-brown (10YR 6/3, dry) or brown to yellowish-brown (10YR 5/3.5, moist) gravelly sandy loam. Weak, fine subangular blocky structure. Common, medium, distinct, strong-brown (7.5YR 5/6, moist) mottles. Friable when moist. Common roots. pH 5.8.<br>Clear boundary: |
| IICg1 | 17 -25 | Coarse sandy gravel of variegated colours. Single-grained. Many coarse, distinct, strong-brown (7.5YR 5/8, moist) mottles. Loose when moist. Occasional roots. pH 5.9.<br>Gradual boundary: |
| IICg2 | 25 + | Coarse sandy gravel of variegated colours. Single-grained. Many, medium, faint mottles. Loose when moist. pH 5.7. |

## Land Use

Most of the Defehr soils occur in association with the well drained Columbia and poorly drained Lehman soils and management is complicated inasmuch as each soil in a complex requires different treatment. The water table frequently is high in winter and some damage to roots of perennials may occur; however, in summer a moisture deficiency occurs and supplemental irrigation is required.

At present most of the cleared areas are used for hay or pasture production. With water table control, irrigation and fertilization, these soils are generally satisfactory for small fruit production. Topography is not limiting. In some areas stones may interfere with cultivation.

## CONCRETIONARY BROWN SOILS

These are soils with thin organic and organic-mineral horizons underlain by a reddish mineral horizon containing numerous small magnetic concretions and have acidic sola. The original vegetation consisted of dense coniferous forest. The only subgroup differentiated in Langley Municipality was the Orthic Concretionary Brown.

## Orthic Concretionary Brown Soils

This subgroup has an organic surface horizon (under natural conditions) which is underlain by one or more reddish-brown Bfcc horizons containing numerous, magnetic concretions or "shot". The lower Bfcc horizon may or may not be underlain by a transitional BC horizon. There is no marked translocation of sesquioxides or clay. Drainage ranges from well to moderately well. Three series, the Nicholson, Abbotsford and Milner, were identified in Langley Municipality.

### Nicholson Series

Nicholson soils occupy a substantial acreage on the uplands of Langley Municipality and occur in complexes with the Whatcom and Scat soil series. The elevations at which these soils occur vary between 30 and 350 feet. The topography varies from very gently undulating to moderately undulating with slopes from two to nine percent. The Nicholson soils are mapped only in soil complexes and are the dominant member in 4,647 acres.

These soils have developed from Whatcom and Newton glacio-marine deposits. Parts of the area may have a shallow aeolian overlay. The glacio-marine materials vary from 25 to 300 feet thick and have silty clay, clay and silt as their dominant textures. The unweathered material is massive, compact and only very slowly permeable. Surface textures are generally silt loam with variations to loam common. Numerous, hard, concretions occur in the upper part of the solum, which usually has a depth of 18 to 24 inches. Acidity is medium at the surface and becomes neutral with depth. Scattered stones may be found in a few areas.

Drainage in this soil series varies from well to moderately well. Soil permeability is good in the solum but decreases abruptly when the parent material is reached. Perching of a temporary water table is indicated in some areas by gleying and mottling in the lower portion of the solum and upper part of the parent material. Occasionally, drainage was observed to be imperfect, however, these areas are of insufficient areal extent to warrant separation.

The Nicholson series is classified as an Orthic Concretionary Brown. It developed under a coastal forest dominantly Douglas fir, cedar and hemlock. This has been largely removed by logging and burning and, in uncleared areas, has been replaced by a dense deciduous cover of alder, birch, cottonwood, and vine maple with a dense shrub layer of thimbleberry, blackberry, elderberry, and bracken. A typical profile, approximately 50 yards southwest of the intersection of Roberts Road and 268th Street, was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | 1 - 0 | Well decomposed to raw deciduous material.<br>pH 4.8.<br>Abrupt boundary: |
| Bfhcc | 0 - 4 | Brown (10YR 5/3, dry) or dark reddish brown (5YR 3/3.5, moist) silt loam. Weak, very fine subangular blocky breaking to weak, fine granular structure. Numerous, hard to very hard, concretions. Very friable when moist. Abundant roots. pH 5.7.<br>Gradual boundary: |
| Bfcc1 | 4 -13 | Yellowish-brown (10YR 5/4, dry) or reddish-brown (5YR 4/4, moist) silt loam. Weak, fine to medium, subangular blocky structure. Numerous, hard concretions. Very friable when moist. Abundant to common roots. pH 6.0.<br>Diffuse boundary: |
| Bfcc2 | 13 -25 | Yellowish-brown (10YR 5/4, dry) or brown to dark-brown (7.5YR 4/4, moist) silt loam. Weak, fine to medium, subangular blocky structure. Numerous, hard, concretions. Friable when moist. Common roots. pH 5.9.<br>Gradual boundary: |
| Bfcc3 | 25 -31 | Yellowish-brown (10YR 5/4, dry) or reddish-brown to yellowish-red (5YR 4/5, moist) silt loam or silty clay loam. Weak, fine, subangular blocky structure. Common to numerous, hard, concretions. Few, fine, faint mottles in lower part. Friable when moist. Common to occasional roots. pH 5.9.<br>Abrupt boundary: |
| Cḡj1 | 31 -37 | Light brownish gray (2.5Y 6/2, dry) or dark grayish brown (2.5Y 4/2, moist) clay loam. Breaks to moderate to strong, medium psuedo-blocky structure. Common, medium, distinct, brown to dark-brown (7.5YR 4/4 - 10YR 4/3, moist) mottles. Firm to very firm when moist. Occasional roots. pH 5.8.<br>Gradual boundary: |
| Cḡj2 | 37 -45 | Light brownish gray (2.5Y 6/2, dry) or gray to olive-gray (5Y 5/1.5, moist) silty clay. Breaks to strong, medium psuedo-blocky structure. Few, fine, faint, brown to dark-brown (10YR 4/3, moist) mottles. Very firm when moist. pH 6.4.<br>Gradual boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| C | 45 + | Light brownish gray (2.5Y 6/2, dry) or olive-gray to grayish-brown (5Y 5/2 - 2.5Y 5/2, moist) silty clay. Breaks to strong, coarse psuedo-blocky structure. Few, very dark-brown (10YR 2/2, moist) coatings on cleavage planes. Very to extremely firm when moist. pH 6.7. |

Land Use

The Nicholson soils are among the best in the upland of Langley Municipality for agriculture. They have good physical and chemical properties and a moderate to high water holding capacity. At the present time the cleared areas are mainly planted to hay and pasture with a few minor areas being used for small fruit and vegetable production. Irrigation, where a water source is available, is beneficial during dry periods. The topography on these soils is undulating and most depressions in the Nicholson series are occupied by the poorly drained Scat series. These frequent wet spots often make management and cultivation of the Nicholson soils difficult.

Substantial acreages of the Nicholson series is still under forest cover or has been allowed to revert to regrowth. When clearing, care should be taken not to remove the solum thereby exposing the underlying parent material. Where the parent material has been exposed, several years of intensive management are required to make it productive. If levelling is attempted, the solum should first be stripped and stock-piled, the underlying parent material levelled and the solum again replaced.

## Milner Series

The Milner soils occur only on the Langley Lowland and Clayton Upland portions of Langley Municipality, usually in association with the Cloverdale and Berry soils. Elevations vary from 50 to 100 feet and the topography ranges from very gently to very steeply sloping and undulating. In the Langley Lowland area, the land surface is very gently to moderately sloping and undulating with slopes from one to nine percent. West of Fort Langley on the Clayton Upland, slopes from 15 to over 30 percent are usual with the ridges and depressions trending southeast-northwest. The Milner series occurs on 111 acres while an additional 3,367 acres are occupied by soil complexes in which the Milner soil is the dominant member.

The parent material consists of heavy textured, relatively impermeable Cloverdale marine sediments, free of gravel and cobbles. Surface textures of silt loam, which occasionally vary to loam or clay loam, gradually become heavier downward in the profile. The clay parent material is usually encountered within 24 inches of the surface. Where land levelling has occurred, the solum is rarely more than 8 inches deep.

This series is moderately well drained and classified as an Orthic Concretionary Brown. Numerous, hard concretions occur in the solum, especially the upper part. Under natural conditions an Ah horizon ½ to 1 inch thick is commonly present. Perching of a temporary water table at the solum-parent material boundary is indicated by weak mottling and gleying in the lower solum and upper parent material. Reaction varies from moderately to strongly acid in the solum to neutral in the parent material.

The Milner series developed under a coniferous forest of Douglas fir, hemlock and cedar with an understory of alder, vine maple, thimbleberry, elderberry, salmonberry, bracken, salal, bleeding heart, trillium, Solomon's seal, and others. An undisturbed profile, located ¼ mile north and 100 yards east of the Wilson Towline-McAdam roads intersection was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L | 2 - 1 | A mixture of raw coniferous and deciduous litter.<br>Abrupt boundary: |
| H-F | 1 - 0 | Mainly well decomposed coniferous and deciduous material. Abundant roots. pH 4.1.<br>Abrupt boundary: |
| Bfhcc | 0 -10 | Light yellowish brown (10YR 6/4, dry) or brown to dark-brown (7.5YR 4/4, moist) silt loam or loam. Weak, fine, subangular blocky structure. Numerous, hard to very hard, concretions. Very friable when moist. Abundant roots. pH 5.1.<br>Gradual boundary: |
| Bfcc | 10 -19 | Pale-brown to light yellowish brown (10YR 6/3.5, dry) or dark yellowish brown (10YR 4/4, moist) silty clay loam. Weak, fine to medium, subangular blocky structure. Numerous, hard concretions. Friable when moist. Abundant to common roots. pH 5.1.<br>Abrupt to clear boundary: |
| Bf | 19 -23 | Light yellowish brown to very pale brown (10YR 6.5/4, dry) or brown to yellowish-brown (10YR 5/3.5, moist) clay loam. Weak to moderate, medium subangular blocky structure. Weak mottling in lower part. Firm when moist. Common to occasional roots. pH 4.9.<br>Clear boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| C1 | 23 -35 | Grayish-brown to dark grayish brown (10YR 4.5/2, moist) clay loam or clay. Moderate to strong, coarse, psuedo-blocky breaking to moderate to strong, fine to medium, psuedo-blocky structure. Few, fine, faint mottles. Very firm when moist. Occasional roots in upper part. pH 4.9.<br>Gradual boundary: |
| C2 | 35 + | Dark-gray (10YR 4/1, moist) clay. Strong, coarse to very coarse, psuedo-blocky structure. Occasional, very dark brown (10YR 2/2, moist) coatings on fracture planes. Extremely firm when moist. pH 6.4. |

### Land Use

Where topographically suitable, the Milner soils are among the best upland soils in Langley Municipality. Cleared areas are presently being utilized for hay and pasture production as well as some silage corn. Most uncleared areas are used for rough pasture.

These soils have good structure and water holding capacities and are more drought resistant than many other upland soils in the area. They are friable, and power requirements for cultivation are not high when topography is relatively level.

The dominant limitation of these soils in Langley Municipality is adverse topography, especially west of Fort Langley. In this area, a large acreage is unsuitable for cultivation and is best utilized as permanent pasture.

When clearing, care should be taken to avoid removing the solum and exposing the parent material. Similarly, when levelling, the solum should be returned to its original position after the underlying parent material is levelled. Additional cultivation, green or barnyard manure and fertilization is required to make the exposed areas of parent material productive.

## Abbotsford Series

This series, a relatively minor one, occurs mainly in the west-central portion of the Langley Upland. The topography is level to gently undulating with slopes up to three percent. A hummocky microrelief caused by uprooting trees is present in uncleared areas. These soils occur mostly between elevations of 175 and 275 feet, usually closely associated with the Columbia series. Fifty acres of

Abbotsford silt loam, 144 acres of Abbotsford silt loam-loam, and 749 acres of Abbotsford-Columbia soil complex were mapped.

The parent material of the Abbotsford soils is shallow aeolian deposits and/or slopewash eroded from surrounding glacio-marine deposits overlying glacial outwash which is up to 125 feet thick. In places, gravels, sand and stones from the underlying deposit have been mixed into the solum by uprooted trees and land clearing. Loam and silt loam are the common surface textures although variation to gravelly loam also occurs. The underlying gravels and sand are usually encountered at 12 to 18 inches.

The Abbotsford series is classified as Orthic Concretionary Brown. Numerous, hard concretions are found in the upper part of the solum. The profile is medium acid at the surface and becomes slightly acid with depth. Drainage in these soils is well to rapid although sometimes slight restriction is caused by weak iron cementation in the IIC horizon.

These soils developed under a forest cover consisting of cedar, hemlock, Douglas fir, alder, lodgepole pine, and cascara. Undergrowth consists of salal, trailing blackberry, red huckleberry, thimbleberry, sword fern, bracken, and moss. An undisturbed profile was examined one-quarter mile north of the corner of 244 Street and 58 Avenue and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | 1 - 0 | Raw to well decomposed mixture of deciduous and coniferous litter. pH 5.1.<br>Abrupt boundary: |
| Bfcc1 | 0 - 5 | Brown to yellowish-brown (10YR 5/3.5, dry) or brown to dark-brown (7.5YR 4/2, moist) loam. Weak, fine, subangular blocky structure. Numerous, hard concretions. Very friable when moist. Abundant roots. pH 5.7.<br>Gradual boundary: |
| Bfcc2 | 5 -11 | Yellowish-brown (10YR 5/4, dry) or brown to dark-brown (7.5YR 4.5/4, moist) loam. Weak, fine, subangular blocky structure. Numerous, hard concretions. Very friable when moist. Abundant to common roots. pH 5.7.<br>Diffuse boundary: |
| Bfcc3 | 11 -17 | Yellowish-brown (10YR 5/4, dry) or brown to dark-brown (7.5YR 4/4, moist) sandy loam. Weak, fine, subangular blocky structure. Common to numerous, hard concretions. Very friable when moist. Common roots. pH 5.7.<br>Clear boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| BIIC | 17 -27 | Pale-brown (10YR 6/3, dry) or light olive brown to yellowish-brown (2.5Y 5/4 - 10YR 5/4, moist) loamy sand. Weak, medium subangular blocky structure. Patches of weak iron cementation. Friable when moist. Common roots. pH 6.0.<br>Diffuse boundary: |
| IIC1 | 27 -34 | Medium to coarse sand of variegated colours. Weak, coarse psuedo-subangular blocky structure breaking to single-grained. Weak iron staining. Very friable when moist. Occasional roots. pH 5.9.<br>Diffuse boundary: |
| IIC2 | 34 + | Medium to coarse sand of variegated colours. Single-grained. Loose when moist. Occasional roots in upper part. pH 6.0. |

### Land Use

Most of the Abbotsford soils are presently cultivated and used for the production of small fruits. One area supports a hazelnut plantation. Scattered hay and pasture fields also are present although the droughty nature of these soils restricts yields.

The Abbotsford soils are well suited for small fruits and vegetables since they warm early in the spring, are well drained and have a smooth topography. Fertility, however, is low and commercial fertilizer and chicken manure are extensively used. When dry farmed, only one cut of hay can be expected, and pastures are generally unproductive during July and August. During most years irrigation is essential for satisfactory production. In most of the Abbotsford soil areas, a water table is available at shallow depths as a source of irrigation water.

## ELUVIATED GLEYSOL SOILS

These soils, developed under poorly drained conditions, may or may not have dark coloured surface horizons. They are characterized by eluvial (Aeg) and illuvial (Btg) horizons which are gleyed and mottled as are the subsoils. Up to 12 inches of peat and/or muck may be present on the surface. The Humic Eluviated Gleysol subgroup of Eluviated Gleysol soils is the only representative occurring in Langley Municipality.

## Humic Eluviated Gleysol Soils

These soils have a dark coloured surface horizon greater than three inches thick which, in turn, is underlain by an eluvial Aeg and illuvial (Btg) horizon in which clay is the main accumulation product. Generally, on drying, the Btg horizon shrinks and cracks to form prismatic structure. On wetting, it swells, the cracks close and the soil becomes very slowly permeable. Drainage is poor and, under natural conditions, an organic surface layer up to 12 inches thick may be present. The subsoil is strongly gleyed.

The Langley and Cloverdale series were identified as Humic Eluviated Gleysol soils.

### Langley Series

The Langley series, occupying 764 acres, occurs only on the Langley Lowland in the vicinity of Milner at elevations between 50 and 75 feet. The topography, very gently to gently undulating, has slopes from one to five percent.

This soil has developed from Cloverdale marine sediments up to 900 feet thick. These massive, alkaline, clay textured sediments have extremely slow permeability. Surface textures, high in organic matter, vary from silt loam and silty clay loam to clay loam; subsurface textures are clay or heavy clay.

The Langley series, classified as a Humic Eluviated Gleysol, developed under swampy vegetation consisting mainly of reeds, sedge and grasses. This vegetation, together with poor drainage conditions, allowed a very deep, highly organic Ah horizon to develop. In a few scattered areas, organic accumulation was sufficient for muck surface horizons to occur. The Ah horizon, usually 12 to 20 inches deep, is underlain by an eluviated Aeg horizon which, in turn, is underlaid by a heavy clay textured Btg horizon.

Present drainage varies from moderately poor to poor. Water movement through the upper solum is good but the almost impervious Btg horizon and parent material causes a perched water table and ponding during periods of high rainfall. Lateral movement of water is also restricted, due mainly to the relatively flat soil surface.

The total acreage of this soil has been cleared and a profile examined in a hay field 200 yards southwest of the Glover-Springbrook roads intersection was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 9 | Very dark gray (10YR 3/1, dry) or black (10YR 2/1, moist) silt loam or silty clay loam. Moderate, medium granular structure. Friable when moist. Abundant roots. pH 5.5.<br>Abrupt boundary: |
| Ah | 9 -15 | Very dark grayish brown (2.5Y 3/2, dry) or very dark brown (10YR 2/2, moist) silty clay loam or silty clay. Weak, medium, subangular blocky breaking to weak, fine, granular structure. Friable when moist. Abundant roots. pH 5.8.<br>Clear boundary: |
| Aeg | 15 -19 | Light brownish gray (2.5Y 6/2, dry) or dark grayish brown (2.5Y 4/2, moist) silty clay. Weak to moderate, medium subangular blocky structure. Few, fine, faint mottles. Friable to firm when moist. Abundant roots. pH 5.7.<br>Clear boundary: |
| BA | 19 -23 | Olive-gray (5Y 5/2, moist) silty clay or clay. Moderate to strong, medium, prismatic breaking to strong, medium, blocky structure. Common, medium, prominent, yellowish-brown (10YR 5/8, moist) mottles. Some degradation on ped surfaces. Occasional clay flows visible. Very firm when moist. Common roots. pH 5.6.<br>Gradual boundary: |
| Btg | 23 -34 | Gray to dark-gray (5Y 5/1-4/1, moist) heavy clay. Strong, medium, prismatic breaking to strong, medium, blocky structure. Common, fine, prominent, yellowish-brown (10YR 5/6-5/8, moist) mottles. Clay flows common. Very to extremely firm when moist. Occasional roots. pH 5.8 in upper part, 6.2 in lower part.<br>Gradual boundary: |
| BC | 34 -40 | Dark-gray (5Y 4/1, moist) heavy clay. Moderate, medium, prismatic breaking to moderate, medium, blocky structure. Common, fine, distinct, dark yellowish brown to yellowish-brown (10YR 4/4-5/6, moist) mottles. Very firm when moist. Occasional roots in upper part. pH 6.5.<br>Gradual boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Cg1 | 40 -51 | Gray to dark-gray (5Y 5/1-4/1, moist) heavy clay. Strong, medium to coarse, psuedo-blocky structure. Common, fine to medium, prominent brown to strong-brown (7.5YR 4/4-5/6, moist) mottles. Occasional dark-brown coatings on fracture planes. Extremely firm when moist. pH 6.7.<br>Diffuse boundary: |
| Cg2 | 51 + | Gray (5Y 5/1, moist) heavy clay. Strong, medium to coarse, psuedo-blocky structure. Common, fine to medium, prominent, brown to strong-brown (7.5YR 4/4-5/6, moist) mottles. Common dark-brown coatings on fracture planes. Extremely firm when moist. pH 6.8. |

## Land Use

The main limitation of the Langley soils is the perched water table during the winter months. Installation of tile drainage is beneficial and those farmers with tiles installed are well satisfied with the results.

At present, most of the Langley soils are utilized for pasture and hay production although some potatoes, silage corn and oats are also produced. Yields are generally good.

The Langley soil is one of the best upland soils in Langley Municipality. It is friable, has a relatively good rooting zone and moderately high water holding capacity as well as being moderately fertile. This is one of the few soils in the upland area not hindered by adverse topography. Irrigation is usually required only during abnormally dry summers.

## Cloverdale Series

The Cloverdale soils occur in the Langley Valley and west of Fort Langley at elevations between 50 and 100 feet. In the Langley Valley, the topography of these soils is very gently to gently sloping and undulating with slopes from one to five percent. West of Fort Langley the Cloverdale soils occupy the lower slopes and shallow depressions in a strongly dissected area occupied mainly by Milner soils. A total of 27 acres of Cloverdale silty clay loam, 403 acres of Cloverdale clay loam and 1,038 acres of Cloverdale clay loam-clay were mapped. An additional 618 acres were classified as several soil complexes in which the Cloverdale soils occupy the dominant acreage.

These soils have developed from Cloverdale marine sediments similar to those from which the Langley series is derived. Surface textures vary from clay loam to silty clay loam and clay; subsurface textures are silty clay or clay.

The Cloverdale soils have been classified as Humic Eluviated Gleysols. The Ah horizon, usually four to six inches deep, is underlain by well developed eluvial Aeg and illuvial Btg horizons. The solum ranges from medium acid near the surface to neutral in the lower part; the parent material is alkaline.

Level topography, seepage in some areas and heavy textured subsoils combine to make the Cloverdale soils poorly drained. Both surface and internal drainage is slow and ponding frequently occurs during the winter months.

These soils developed under a heavy mixed forest of cottonwood, birch, alder, cascara, cedar, and hemlock with a dense shrub layer of salmonberry, devils' club, hardhack, elderberry, and other moisture tolerant species. A profile, examined in a ditch cut approximately one-quarter mile east of the Roberts-Johnson Townline roads intersection, was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 6 | Dark-gray to dark grayish brown (10YR 4/1.5, dry) or very dark brown (10YR 2/2, moist) silty clay loam. Moderate, medium, granular structure. Friable when moist. Abundant roots. pH 5.6.<br>Abrupt boundary: |
| Aeg | 6 -10 | Light-gray (10YR 7/2, dry) or grayish-brown (2.5Y 5/2, moist) silt loam or silty clay loam. Moderate, medium, subangular blocky structure. Many, medium, distinct, yellow (10YR 7/6-7/8, dry) mottles. Friable when moist. Abundant roots. pH 5.6.<br>Clear boundary: |
| AB | 10 -13 | Light-gray to grayish-brown (10YR 7/1-5/2, dry) or dark grayish brown (2.5Y 4/2, moist) silty clay loam. Moderate, medium, prismatic breaking to strong, medium, subangular blocky structure. Many, medium, distinct, brownish-yellow (10YR 6/6, dry) mottles. Firm to very firm when moist. Abundant to common roots. pH 5.9.<br>Clear to gradual boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Btg1 | 13 -19 | Light olive gray to olive-gray (5Y 5.5/2, dry) or dark grayish brown to olive-gray (2.5Y 4/2 - 5Y 4/2, moist) silty clay. Moderate, fine prismatic breaking to strong, coarse subangular blocky structure. Many, medium to coarse, distinct, brownish-yellow (10YR 6/6, dry) mottles. Clay skins common. Very firm when moist. Common to occasional roots. pH 6.7.<br>Gradual boundary: |
| Btg2 | 19 -28 | Gray to light-gray (5Y 6/1, dry) or olive (5Y 4/3, moist) silty clay. Moderate, fine prismatic breaking to strong, coarse subangular blocky structure. Common to many, medium, distinct, yellow (10YR 7/6, dry) mottles. Clay skins common. Very firm when moist. Occasional roots, mainly strong vertical cracks. pH 7.8.<br>Gradual boundary: |
| BC | 28 -37 | Dark-gray (5Y 4/1, moist) silty clay. Weak, medium prismatic to massive structure. Common, medium, distinct, yellowish-brown to dark yellowish brown (10YR 5/6-4/4, moist) mottles. Very firm when moist. Occasional roots in upper part. pH 7.9.<br>Gradual boundary: |
| Cg1 | 37 -48 | Gray to dark-gray (5Y 4.5/1, moist) silty clay. Massive. Common, medium, prominent, strong-brown to dark-brown (7.5YR 5/6-4/4, moist) mottles. Very firm when moist. pH 7.8.<br>Diffuse boundary: |
| Cg2 | 48 + | Gray to dark-gray (5Y 4.5/1, moist) silty clay. Massive. Widely spaced vertical cracks. Common, medium, prominent, strong-brown to dark-brown (7.5YR 4/6-4/4, moist) mottles. Occasional black coatings along fracture planes. Very firm when moist. pH 8.0 |

## Land Use

Most of the Cloverdale soils are under cultivation and are utilized for hay and pasture production. Some silage corn and oats are also grown.

The main restrictions of the Cloverdale series is poor drainage and a rather shallow rooting depth. A perched water table caused by the relatively impermeable Btg horizons and parent material commonly reduces clover content in pasture and forage stands. Tile installation to control the water table and subsoiling to improve rooting depth should be practised. High power requirements for cultivation, particularly when dry, are caused by the heavy textures. These soils must be cultivated at the correct moisture content; they puddle if worked too wet or become cloddy if they are too dry.

These soils have good water holding capacities and moderate fertility levels, and produce good yields if managed well.

## HUMIC GLEYSOL SOILS

This group of soils has developed under poor drainage conditions and are characterized by a dark coloured surface horizon greater than three inches thick which is underlain by one or more gleyed and mottled horizons. Weakly developed eluvial and illuvial horizons may be present. There may be up to 12 inches of peat or muck on the surface. In the uplands of Langley Municipality the Humic Gleysol soil group is represented by the Rego Humic Gleysol subgroup.

### Rego Humic Gleysol Soils

This subgroup is distinguished by a dark coloured Ah horizon more than three inches thick, underlain by one or more gleyed and mottled Cg horizons. There are no eluvial or illuvial horizons and up to 12 inches of peat or muck may occur on the surface. The Scat, Heron, Livingstone, Boosey, Lehman, Jackman, Cornock, Ross, and Carvolth series represent the Rego Humic Gleysol soils on the uplands of Langley Municipality.

### Scat Series

The Scat series occurs throughout the upland areas of Langley Municipality at elevations between 150 and 400 feet and is usually closely associated with the Whatcom and Nicholson soils. The topography is slightly depressional or level to gently and moderately sloping. Gradients are usually less than five percent. In Langley Municipality the Scat series occupies 1,086 acres of which 34 and 112 acres are differentiated as Scat silt loam and clay loam-silty clay loam respectively. Several soil complexes dominated by the Scat soils encompass another 2,743 acres.

This soil has developed from Whatcom and Newtown glacio-marine sediments which are compact and very slowly permeable. Surface textures are usually silty clay loam with minor areas having loam, clay loam and silt loam textures. Subsurface textures are usually heavier.

Surface runoff and seepage from higher elevations accumulates on the depressional or relatively level Scat areas. This excess moisture, combined with very slow internal drainage and nearly impervious parent material, results in these soils being poorly to very poorly drained.

The Scat soils are classified as Rego Humic Gleysols although a few scattered areas exhibit the morphology of Orthic Humic Gleysol soils. Native vegetation consists of dense stands of alder, birch, vine maple, and scattered Douglas fir, cedar and hemlock with an understory of elderberry, blackberry, hardhack, salmonberry, sedge, skunk cabbage, and others. A typical profile located one-quarter mile north and 100 yards east of the Swain Road-Fraser Valley Highway intersection was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | ½- 0 | Mixture of raw to well decomposed deciduous plant material. pH 4.4.<br>Abrupt boundary: |
| Ah | 0 - 5 | Dark-gray (10YR 4/1, dry) or black (10YR 2/1, moist) silty clay loam. Weak, medium subangular blocky breaking to weak, medium granular structure. Friable when moist. Abundant roots. pH 5.3.<br>Abrupt boundary: |
| Cg1 | 5 -11 | Grayish-brown (2.5Y 5/2, moist) silty clay. Moderate, medium to coarse, psuedo-blocky structure. Many, medium, prominent, strong-brown (7.5YR 5/8, moist) mottles. Firm when moist. Common roots. pH 5.6.<br>Gradual boundary: |
| Cg2 | 11 -18 | Grayish-brown (2.5Y 5/2, moist) silty clay. Moderate, coarse, psuedo-blocky structure. Common, medium, distinct, dark yellowish brown (10YR 4/4, moist) mottles. Occasional very dark brown (10YR 2/2, moist) coatings along cleavage planes. Firm when moist. Occasional roots. pH 6.0.<br>Gradual boundary: |
| Cg3 | 18 -26 | Grayish-brown (2.5Y 5/2, moist) silty clay or clay. Massive. Few, medium distinct, yellowish-brown (10YR 5/4, moist) mottles. Occasional very dark brown (10YR 2/2, moist) coatings along cleavage planes. Very firm when moist. Occasional roots. pH 6.5.<br>Gradual boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Cg4 | 26 + | Grayish-brown (2.5Y 5/2, moist) silty clay or clay. Weakly stratified breaking to strong, coarse psuedo-blocky structure. Few, medium, distinct, yellowish-brown (10YR 5/4, moist) mottles. Common, very dark brown (10YR 2/2, moist) coatings along cleavage planes. Extremely firm when moist. pH 6.8. |

## Land Use

Those areas of Scat soils which have been cleared are used for hay and pasture production. Poor drainage, however, retards growth in early spring as well as destroying most of the clovers and domestic grasses which are replaced by sedge and other water tolerant plants of low feed value.

Drainage systems are required to improve growth and widen the spectrum of crops able to be grown. However, drainage of depressional areas is difficult due to lack of outlets and may be uneconomic in small areas unless high income crops are produced. Areas of Scat soils in fields dominantly composed of Whatcom or Nicholson soils, hamper cultivation because they are still wet after the other soils have dried sufficiently to be cultivated. Reclamation of forested areas requires heavy clearing and expensive drainage.

The Scat soils are of fair to poor suitability for agricultural production. The main limitations are poor drainage, poor structure and shallow rooting depth. Unlike most well drained upland soils, the available phosphorus level is low.

Some areas can be developed as "dugouts" for water storage and utilized for small scale irrigation or stock-watering.

## Heron Series

The Heron soils occupy scattered, minor areas in the western portion of Langley Municipality at elevations between 50 and 150 feet. They occupy depressional areas in which the topography is mostly level to gently sloping. Twenty-eight acres were mapped as the Heron series with an additional 143 acres classified in two soil complexes dominated by the Heron soils.

The parent material consists of shallow deposits of Sunnyside sands which overlie Cloverdale marine or Newton glacio-marine sediments. The depth of the overlay is usually between 12 to 36 inches, but occasionally varies up to 5 feet thick.

Surface textures are sandy loam with minor variations to fine sandy loam and loamy sand. All textures grade to sand at about 10 inches. The underlying marine or glacio-marine materials are clay loam to clay textured and almost impermeable to water. Water perches above these impervious deposits due to excessive rainfall and seepage, and causes the Heron soil to be poorly drained.

The Heron series is classified as a Rego Humic Gleysol. Present forest cover consists of alder, cottonwood, vine maple, and scattered cedar, with an undergrowth of hardhack, salmonberry, sedges, ferns, and moss. An undisturbed profile, examined southeast of the Hall's Prairie-Wade roads junction in Surrey Municipality, was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L | 2 - 1 | Fresh deciduous forest litter.<br>Abrupt boundary: |
| F | 1 - 0 | Partly decomposed organic litter containing many fine roots. pH 4.7.<br>Abrupt boundary: |
| Ah | 0 - 6 | Very dark brown (10YR 2/2, moist) fine sandy loam. Very weak, medium, subangular blocky structure. Small, ferruginous concretions in lower inch. Very friable when moist. Abundant roots. pH 5.0.<br>Abrupt boundary: |
| AC | 6 - 8 | Dark grayish brown (10YR 4/2, moist) sandy loam. Moderate, medium, subangular blocky structure. Moderate content of irregularly shaped ½ to 1" pieces of iron cemented material. Very friable when moist. Occasional to common roots. pH 5.8. |
| IICg | 8 -16 | Grayish-brown (10YR 5/2, moist) sand. Single-grained except for massive, very weakly cemented pockets. Common, faint, dark yellowish brown (10YR 4/4, moist) mottles. Loose when moist. Occasional roots. pH 5.8. |
| IIC and IIIC | 16 -25 | Grayish-brown (10YR 5/2, moist) mixture of sand and clay loam strata. Massive. Many, prominent, red (5Y 4/6-4/8, moist) mottles. Friable when moist. Occasional roots. pH 5.5. |
| IIICg | 25 + | Grayish-brown (2.5Y 5/2, moist) clay loam or clay. Massive. Common, distinct mottles. Firm when moist. Slightly sticky and plastic when wet. pH 5.4. |

## Land Use

Only a portion of the Heron soils have been cleared and are utilized for hay and pasture production. Yields are generally poor in undrained areas and swards contain large amounts of sedge and other low nutrient weeds. Substantial improvement occurs where drainage is provided. In dry summers irrigation is required because of the poor water holding capacity of these soils.

Reclamation of uncleared areas involves heavy clearing and installation of drainage systems.

## Livingstone Series

The Livingstone soils are confined to the Langley Valley between elevations of 50 and 100 feet and are frequently associated with the Murrayville series. Topography varies from very gently to gently undulating with slopes ranging from one to five percent. Twelve acres were mapped as Livingstone series, 38 acres as Livingstone loam and 194 acres as Livingstone loam-silt loam. An additional 1,065 acres occur as soil complexes in which the Livingstone soil occupies the dominant acreage.

The parent material consists of a shallow, medium textured capping of slopewash and reworked marine materials over one to three feet of littoral sands which, in turn, overlie Cloverdale marine sediments. Common surface textures are loam or silt loam, with minor variations to silty clay loam and fine sandy loam.

This soil has been classified as a poorly to moderately poorly drained Rego Humic Gleysol. The Ah horizon is high in organic matter content and usually varies in depth from 6 to 12 inches. Drainage restrictions are caused by the nearly impervious marine sediments and slow runoff due to flat topography. Native vegetation consisted mainly of cedar, cottonwood and hemlock, with an understory of hardhack, sedge and other moisture tolerant species. Most areas are cleared and a profile in a cultivated field 100 yards west of Glover Road along the new highway north of Langley was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 6 | Very dark grayish brown to dark-brown (10YR 3/2.5, dry) or black (10YR 2/1, moist) silt loam. Weak, medium, subangular blocky breaking to weak, fine to medium, granular structure. Friable when moist. Abundant roots. pH 5.5.<br>Abrupt boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| AC | 6 - 8 | Dark grayish brown to brown (10YR 4/2.5, dry) or very dark grayish brown (10YR 3/2, moist) loam or silt loam. Weak, fine to medium, subangular breaking to weak, medium granular structure, Occasional, faint, mottles. Friable when moist. Abundant roots. pH 5.5. Clear boundary: |
| Cg | 8 -13 | Pale-brown (10YR 6/3, dry) or olive-brown (2.5Y 4/4, moist) loam or silt loam. Breaks to weak, fine, psuedo-subangular blocky structure. Common to many, medium, distinct, strong-brown (7.5YR 5/6, moist) mottles. Firm when moist. Abundant to common roots. pH 5.8. Clear boundary: |
| IICg1 | 13 -19 | Brown to yellowish-brown (10YR 5/3.5, moist) medium to coarse sand. Weakly compact, breaking to single-grained. Many, medium, distinct, dark-brown to brown (7.5YR 4/4, moist) mottles. Occasional weakly iron cemented patches. Very friable to loose when moist. Occasional roots. pH 6.4. Clear boundary: |
| IICg2 | 19 -25 | Medium sand of variegated colour. Single-grained. Many, coarse, prominent, reddish-brown to dark reddish brown (5YR 3.5/4, moist) mottles. Occasional, weakly iron cemented patches. Loose when moist. pH 6.6. Abrupt boundary: |
| IIICg1 | 25 -37 | Gray (5Y 5/1, moist) clay. Massive. Many, medium, prominent, reddish-yellow to reddish-brown (7.5YR 7/6 - 5YR 4/4, moist) mottles. Very firm when moist. pH 6.5. Diffuse boundary: |
| IIICg2 | 37 + | Gray to dark-gray (5Y 4.5/1, moist) clay. Massive. Common, fine to medium, distinct, dark yellowish brown (10YR 4/4, moist) mottles. Very firm when moist. pH 6.2. |

## Land Use

Almost all the Livingstone soils have been cleared and are being utilized for hay and pasture production. Some potatoes and corn are also grown.

Unless the water table is lowered by tile drains, most perennial crops suffer from "wet feet" during the winter months. Clovers are often killed and replaced by sedge, buttercup and other water tolerant weeds. If adequately drained, the depth to the underlying marine sediments is generally sufficient for a satisfactory rooting zone.

These soils are friable and have gentle topography, conditions which make for easy mechanical cultivation.

During dry summers, drought conditions may develop due to the rather low water holding capacity of the solum with some irrigation necessary for good crop yields.

## Boosey Series

This series occurs in a few locations in the uplands west of the Campbell River valley and on the Clayton Upland. Elevations range from 100 to 250 feet. Boosey soil areas are usually small in size and occur in association with the Scat and Bose series. They occur in depressions where the topography is level to gently sloping. A total of 10 acres were mapped as Boosey loam.

The parent material of the Boosey soils is the same as for the Bose series; that is, lag-gravels mainly one to three feet thick over Newton glacio-marine deposits which are heavy textured, compact and very slowly pervious. The main surface texture is gravelly sandy loam, with areas of loam and sandy loam also occurring. Textures become more gravelly and sandy with depth and stone content varies from moderate to heavy.

The Boosey soils are classified as Rego Humic Gleysols. They have high water tables for much of the year and are poorly drained. The impervious subsoil restricts percolation of water which accumulates through runoff and seepage from surrounding higher land. Forest cover is composed of cottonwood, alder, maple, and birch with a heavy undergrowth of hardhack, salmonberry, sedge, sword fern, and moss. A undisturbed profile was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-F | 1½- 0 | Deciduous forest litter and moss, well decomposed in the lower part. pH 5.0.<br>Abrupt boundary: |
| Ah | 0 - 6 | Very dark brown (10YR 2/2, moist) gravelly sandy loam. Weak, medium, granular structure. Scattered cobbles. Very friable when moist. Abundant roots. pH 5.3.<br>Abrupt boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| IICg1 | 6 -12 | Grayish-brown (10YR 5/2, moist) gravelly loamy sand or gravelly sand. Single-grained. Common, faint, dark yellowish brown (10YR 4/4, moist) mottles. Scattered cobbles. Loose when moist. Occasional roots. pH 5.8.<br>Gradual boundary: |
| IICg2 | 12 -22 | Grayish-brown (2.5Y 5/2, moist) gravelly sand. Single-grained. Few, medium, distinct, yellowish-brown (10YR 4/4, moist) mottles. Scattered cobbles. Loose when moist. Occasional roots. pH 6.0.<br>Clear boundary: |
| IIICg | 22 + | Grayish-brown (2.5Y 5/2, moist) silty clay loam. Massive. Common, medium, distinct, mottles. Occasional gravels and cobbles. Firm when moist. pH 5.7. |

### Land Use

Most of the Boosey soils are uncleared. Those areas that are cultivated produce unsatisfactory pasture and hay because of high content of sedge and other water tolerant plants. Severe limitations to agricultural production is imposed by coarse texture, poor drainage, stoniness, and low plant nutrient supplies. Most of the uncleared areas do not warrant reclamation because of high clearing and drainage costs.

## Lehman Series

The Lehman series occupies scattered areas in the southern and central portions of the uplands of Langley Municipality, and is frequently associated with the Custer, Defehr and Columbia soils. Topography varies from very gently to gently undulating with slopes from two to five percent; some slightly depressional areas also occur. Elevations range from 150 to 300 feet. The Lehman series occupies 308 acres of which 143, 30 and 59 acres are differentiated as Lehman sandy loam-loamy sand, loam-gravelly loam and loam respectively. Several soil complexes in which Lehman soils are the dominant member total another 1,098 acres.

These soils are derived from glacial outwash deposits up to 125 feet deep. Commonly they are capped by medium textured aeolian or slopewash materials for a depth of 5 to 12 inches. Some areas occur along abandoned and occupied stream channels; others occupy areas influenced by seepage water from higher land. Surface textures are loam or silt loam, with minor variations to sandy loam and loamy sand.

Stones, common in the underlying outwash, are often covered with a sufficient depth of overlay to provide a relatively stone free cultivated layer.

This soil series is classified as a poorly drained Rego Humic Gleysol. The poor drainage is caused by runoff and seepage from adjacent land as well as lateral seepage from streams. Native vegetation consists of cedar, alder, aspen, cottonwood, cascara, hardhack, devils' club, skunk cabbage, sweet gale, ferns, moss, and others. An undisturbed profile located one-third mile east and one-quarter mile north of the Otter-Bernson roads intersection was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | 1 - 0 | Raw to well decomposed deciduous litter and moss. pH 4.8.<br>Abrupt boundary: |
| Ah | 0 - 6 | Dark-gray (10YR 4/1, dry) or very dark brown (10YR 2/2, moist) silt loam. Weak, fine to medium, subangular blocky breaking to weak, medium, granular structure. Friable when moist. Abundant roots. pH 4.7.<br>Clear boundary: |
| AC | 6 -10 | Gray (10YR 5/1, dry) or dark-brown (10YR 3/3, moist) silt loam or loam. Moderate, medium, subangular blocky structure. Friable when moist. Abundant roots. pH 5.4.<br>Clear boundary: |
| IICg1 | 10 -17 | Grayish-brown (2.5Y 5/2, moist) gravelly sandy loam or gravelly loamy sand. Weak, medium, psuedo-subangular blocky structure. Common, fine, prominent, strong-brown (7.5YR 5/6, moist) mottles. Common cobbles. Firm when moist. Common roots. pH 5.8.<br>Gradual boundary: |
| IICg2 | 17 -36 | Light brownish gray to grayish-brown (2.5Y 5.5/2, moist) gravelly medium sand. Many, coarse, distinct to prominent, strong-brown to yellowish-brown (7.5YR 5/6 - 10YR 5/6, moist) mottles. Patches of weakly iron cemented material. Common cobbles. Loose when moist. Common roots in upper part, occasional in lower part. Single-grained. pH 6.0.<br>Gradual boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| IICg3 | 36 + | Gravelly coarse sand of variegated colours. Single-grained. Few, fine, faint mottles. Scattered cobbles. Loose when moist. pH 6.0. |

Land Use

Most of the Lehman soils are not cultivated; those areas which are produce pasture and forage and are managed similarly to the surrounding soils. High water tables destroy most of the clovers and other domesticated grasses and are replaced by sedge and water tolerant weeds. Small fruits are unsatisfactory because of the poor drainage.

Reclamation involves heavy clearing and drainage. When reclaimed, the Lehman soils require irrigation in the dry season because of the poor water holding capacity of the profile.

## Jackman Series

The Jackman soils occur in scattered locations on the uplands of Langley Municipality, usually near the boundaries between glacio-marine and glacial outwash deposits. The topography is frequently depressional and varies from very gently to gently undulating with slopes from two to five percent. Elevations range from 200 to 300 feet. Usually the Jackman soils are associated with the Aldergrove and Scat series. Sixty-six acres were mapped as Jackman series, 64 acres as Jackman loam, 266 acres as Jackman silt loam, and 134 acres as Jackman silt loam-silty clay loam. Several soil complexes dominated by the Jackman series encompass a further 804 acres.

These soils have developed on shallow glacial outwash which overlies Whatcom glacio-marine deposits. Depth of the outwash overlay usually is one to four feet but in some areas may be as deep as six feet. A very shallow capping of aeolian and/or eroded material from adjacent glacio-marine areas covers most of the outwash. Surface textures are mostly loam or silt loam varying to gravelly loam, sandy loam and silty clay loam in some areas. Scattered stones may occur in the surface, particularly wherever the glacial outwash is stony.

This soil has been classed as a Rego Humic Gleysol. Drainage is poor and is caused by runoff and seepage from adjacent higher land. Although water movement through the outwash is good, it is impeded by the slowly pervious glacio-marine material, and a perched water table exists throughout much of the year. Morphologically, the Jackman series is similar to the Boosey series and similar native vegetation is found on both. A cultivated profile, located one-quarter mile northwest of the North Bluff-Berry roads intersection, was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 8 | Dark-gray (10YR 4/1, dry) or black to very dark brown (10YR 2/1.5, moist) sandy loam or loam. Weak, medium, subangular blocky structure. Friable when moist. Abundant roots. pH 5.9.<br>Abrupt boundary: |
| IICg1 | 8 -15 | Grayish-brown to dark grayish brown (10YR 4.5/2, moist) medium sand. Very weak, medium, psuedo-subangular blocky structure breaking to single-grained. Many, coarse, distinct, brown to dark-brown (7.5YR 4/4, moist) mottles. Very friable to loose when moist. Common roots in upper part, occasional in lower part. pH 5.9.<br>Clear boundary: |
| IICg2 | 15 -23 | Dark grayish brown (2.5Y 4/2, moist) medium to coarse sand. Single-grained. Many, coarse, distinct, brown to dark yellowish brown (7.5YR 4/4 - 10YR 4/4, moist) mottles. Loose when moist. Occasional roots. pH 6.3.<br>Abrupt boundary: |
| IIICg1 | 23 -31 | Gray to olive-gray (5Y 5/1.5, moist) silty clay loam or silty clay. Breaks to moderate, medium psuedo-blocky structure. Common, medium, prominent, yellowish-brown (10YR 4/4-5/6, moist) mottles. Firm to very firm when moist. pH 6.1.<br>Gradual boundary: |
| IIICg2 | 31 -41 | Dark grayish brown (10YR 4/2 - 2.5Y 4/2, moist) silty clay loam or silty clay. Breaks to strong, medium to coarse, psuedo-blocky structure. Common, medium, faint to distinct, dark yellowish brown (10YR 4/4, moist) mottles Very firm when moist. pH 6.2.<br>Diffuse boundary: |
| IIICg3 | 41 + | Dark grayish brown (10YR 4/2 - 2.5Y 4/2, moist) sandy clay loam or clay loam. Massive. Few, medium, faint to distinct, dark yellowish brown (10YR 4/4, moist) mottles. Extremely firm when moist. pH 6.5. |

## Land Use

Parts of the Jackman soil area are still under forest; cultivated areas are used mainly for hay and pasture production. Yields and food value of the forage is low because of high contents of sedge and other moisture tolerant plants. Clovers and other plants which suffer from high water tables soon die. Artificial drainage is required but outlet location is sometimes a problem in these depressional soils. Since the upper portions of the profiles has a low water holding capacity, irrigation is beneficial during dry summers.

## Cornock Series

The Cornock soil is confined to minor areas in Glen Valley and near Fort Langley between 15 and 25 feet elevation. The topography is very gently to gently sloping and undulating with gradients from two to five percent. Sixty-one acres of Cornock silt loam-loam and nine acres of Cornock-Hallert soil complex were mapped.

The parent material consists of shallow Fraser River sediments which overlie glacial outwash sands and gravels. These sediments occur at slightly higher elevations than those on the lowland, and have surface textures varying from silt loam to silty clay loam. The underlying outwash is encountered 15 to 24 inches below the surface.

This soil is now poorly to imperfectly drained, with indications that it was more poorly drained at some previous time. The improvement is due largely to artificial drainage and control of the water table in the surrounding soils. A cultivated profile one-quarter mile west of the Cornock-Jackman roads intersection in Langley Municipality was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 8 | Dark-gray (5YR 4/1, dry) or black (5YR 2/1, moist) silt loam. Moderate, medium, granular structure. Friable when moist. Abundant roots. pH 5.6.<br>Abrupt boundary: |
| Ah | 8 -12 | Dark-gray (10YR 4/1, dry) or very dark gray (10YR 3/1, moist) silt loam. Moderate, medium, granular structure. Friable when moist. Abundant roots. pH 5.3.<br>Abrupt boundary: |
| Cg | 12 -14 | Light brownish gray (2.5Y 6/2, dry) or dark grayish brown (2.5Y 4/2, moist) silty clay loam. Moderate, medium, psuedo-subangular |

| Horizon | Depth Inches | Description |
|---|---|---|
| | | blocky structure. Common, medium, distinct, yellowish-brown (10YR 5/6, moist) mottles. Firm when moist. Common roots. pH 5.2.<br>Abrupt boundary: |
| IIAhg | 14 -18 | Grayish-brown (10YR 5/2, dry) or dark-gray to very dark grayish brown (10YR 4/1-3/2, moist) silty clay loam. Moderate, medium, subangular blocky structure. Common, medium, distinct, brown to strong-brown (7.5YR 5/5, moist) mottles. Very firm when moist. Common roots. pH 5.1.<br>Abrupt boundary: |
| IIIC1 | 18 -31 | Pale-brown (10YR 6/3, dry) or dark yellowish brown (10YR 4/4, moist) coarse sandy loam. Fine, psuedo-subangular blocky structure breaking to single-grained. Fine material coated on gravel. Very friable when moist. Occasional roots. pH 5.5.<br>Gradual boundary: |
| IIIC2 | 31 + | Fine gravel of variegated colours. Single-grained. Scattered cobbles. Loose when moist. pH 5.6. |

### Land Use

All the acreage of Cornock soils is being used for pasture and forage crop production. Yields are good although irrigation is beneficial during the latter part of dry summers. Because of its higher elevation, the Cornock soils also benefit from improved drainage in the surrounding lowland soils.

## Ross Series

The Ross soils occupy minor, scattered areas on the uplands of Langley Municipality. Topography varies from very gently sloping to gently undulating and slopes vary from two to five percent. Elevations are from 150 to 300 feet. Frequently the Ross soils are closely associated with the Lehman series and Judson muck. In Langley Municipality, the Ross series occupies 273 acres of which Ross silt loam and Ross silty clay loam occupy 69 and 98 acres respectively. An additional 429 acres were mapped as several soil complexes in which the Ross soil is the dominant member.

The parent material of the Ross series consists of sediments eroded from glacio-marine material at higher elevations and redeposited as meander scrolls and levees on the narrow floodplains of Campbell River and other upland streams. Sometimes the floodplain occurs at the bottom of steep sided ravines, at other times it occurs only a few feet lower than the surrounding area.

Surface textures vary from silt loam to silty clay loam. Usually outwash gravels and sand occur at depths greater than 24 inches; sometimes, however, the parent material has been deposited directly on unweathered glacio-marine material.

The Ross series, classified as a Rego Humic Gleysol, includes minor areas of Rego Gleysol soils. Drainage varies from poor to very poor and is caused by frequent flooding and lateral seepage from the streams as well as seepage from higher adjacent areas. Natural vegetation consists of alder, willow, dogwood, hardhack, sedge, buttercup, and others. A typical undisturbed profile about 200 feet southwest of the Marshall-Mount Lehman Road junction in Matsqui Municipality was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ah | 0 - 9 | Dark-gray to gray (10YR 4.5/1, dry) or very dark gray (10YR 3/1, moist) silt loam. Weak, medium, subangular blocky structure. Few, fine, faint mottles. Very friable when moist. Abundant roots. pH 4.7.<br>Gradual boundary: |
| AC | 9 -13 | Grayish-brown (10YR 5/2, dry) or dark grayish brown (10YR 4/2, moist) silt loam. Weak, medium, subangular blocky structure. Common, medium, faint, brown to dark-brown (10YR 4/4, moist) mottles. Very friable when moist. Common roots. pH 5.3.<br>Abrupt boundary: |
| Cg1 | 13 -22 | Light-gray (10YR 6/1, dry) or gray (5Y 5/1, moist) silty clay loam. Moderate, medium, psuedo-subangular blocky structure. Many, medium, prominent, strong-brown (7.5YR 5/6, moist) mottles. Firm when moist. Occasional roots. pH 5.4.<br>Gradual boundary: |
| Cg2 | 22 + | Light olive gray (5Y 6/2, dry) or dark-gray to gray (5Y 4.5/1, moist) silty clay. Massive. Few, medium, prominent, brown to dark-brown (7.5YR 4/4, moist) mottles. Extremely firm when moist. pH 6.2. |

## Land Use

Minor areas of the Ross series are presently cleared and used for hay and pasture production. Most uncleared areas provide rough grazing. Reclamation involves clearing dense swamp forest and expensive drainage installation which may not produce the desired results because of lateral seepage from streams and frequent flooding. Areas of Ross soils are frequently small, making specialized cultivation impracticable. Sometimes the Ross soils occur at the bottom of deep ravines and access is difficult. When required, irrigation water is readily available from the nearby creeks and streams.

## Carvolth Series

The Carvolth soils occur in the Langley Valley between elevations of 30 and 100 feet. The topography is mainly gently to moderately undulating with slopes from one to nine percent. One hundred and seventy-two acres are mapped as Carvolth series. Carvolth loam-silt loam, Carvolth silt loam-silty clay loam and Carvolth silty clay loam occupy 52, 191 and 118 acres respectively, and an additional 120 acres are classified as soil complexes in which the Carvolth soils predominate.

The parent material consists of the erosion products of streams flowing over Cloverdale marine sediments and minor areas of Sunnyside sand. These deposits generally occur as narrow floodplains bordering the streams but may assume fan shapes at the mouths of some streams. Predominant surface textures are silty clay loam or silt loam, with minor variations to loam and clay loam. Sandy lenses may occur in the profile, especially in areas close to the Sunnyside sands.

These poorly to very poorly drained soils are susceptible to flooding during periods of heavy rainfall. They are also subject to seepage from adjacent streams and nearby higher land.

The Carvolth series, classified as a Rego Humic Gleysol, includes some Rego Gleysol soils. Typical natural vegetation consists of willow, cottonwood, vine maple, blackberry and occasional cedar. Most areas are presently cleared and a profile examined in a pasture 100 yards east of the junction of Marbleson Street and the Nicomekl River was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 4 | Grayish-brown (10YR 5/2, dry) or very dark grayish brown (10YR 3/2, moist) silty clay loam or silt loam. Moderate, fine to medium, subangular blocky structure, somewhat vesicular. Few to common, fine, faint, dark-brown (7.5YR 4/4, moist) mottles. Firm when moist. |

| Horizon | Depth Inches | Description |
|---|---|---|
| | | Abundant roots. pH 5.6.<br>Clear boundary: |
| AC | 4 - 9 | Dark grayish brown (10YR 4/2, moist) silty clay loam. Moderate, fine to medium, subangular blocky structure. Common, fine to medium, distinct, dark reddish brown to yellowish-red (5YR 3/4-4/6, moist) mottles. Firm when moist. Abundant roots. pH 5.6.<br>Gradual boundary: |
| Cg1 | 9 -15 | Grayish-brown to dark grayish brown (2.5Y 4.5/2, moist) silty clay loam. Moderate, medium to coarse, psuedo-subangular blocky structure. Common, fine, prominent, dark reddish brown to yellowish-red (5YR 3/4-4/6, moist) mottles. Firm when moist. Abundant roots. pH 6.0.<br>Gradual boundary: |
| Cg2 | 15 -37 | Very dark grayish brown (2.5Y 3/2, moist) silty clay loam. Moderate, medium to coarse, psuedo-subangular blocky structure. Many, medium, distinct, strong-brown to dark reddish brown (7.5YR 5/6 - 5YR 3/3, moist) mottles. Firm when moist. Common roots. pH 6.4.<br>Gradual boundary: |
| Cg3 | 37 + | Dark-gray (5Y 4/1, moist) silty clay or clay. Moderate, medium to coarse, psuedo-subangular blocky structure. Many, fine to medium, distinct, dark-brown to brown (7.5YR 3/2-4/4, moist) mottles. Very firm when moist. pH 6.4. |

### Land Use

A large portion of the Carvolth soils have been cleared with most being used for hay and pasture production. These are the most suitable crops due to poor drainage and susceptibility to flooding.

These soils are hard to manage independently from surrounding soils in that they occur as narrow bands along streams.

## GLEYSOL SOILS

For a generalized description of Gleysol soils, refer to page of this report.

Only the Rego Gleysol subgroup of Gleysol soils occur in the upland areas of Langley Municipality.

## Rego Gleysol Soils

Refer to page 90 of this report for a generalized description of Rego Gleysol soils..

The Sardis series is the only Rego Gleysol representative occurring in the uplands of Langley Municipality.

### Sardis Series

. This soil, at elevations from 10 to 150 feet, occupies minor acreages near streams on the uplands, and lowlands of Langley Municipality. The topography is level to gently undulating.

The parent materials consist of coarse sands and gravels, eroded from glacial outwash areas and redeposited along the margins of creeks during their freshet stages. Surface textures vary from gravelly sand to sandy loam and are underlain by coarse gravels. A total of 62 acres were mapped as the Sardis series and an additional 179 acres as soil complexes in which this soil is dominant.

Because of variable drainage and age, the Sardis soils range from Orthic Regosols to Rego Gleysols, the latter occupying the largest acreage. Most of the area is still uncleared and supports a vegetation consisting of cottonwood, alder, willow, cedar, and some maple, salmonberry, and sedge. A description of a cultivated profile is as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 7 | Dark grayish brown (10YR 4/2, moist) sandy loam or loamy sand. Weak, subangular blocky breaking to granular structure. Friable when moist. Common roots. pH 5.6.<br>Abrupt boundary: |
| Cg1 | 7 -13 | Grayish gravelly sand with faint mottles. Common to occasional roots. Single-grained. Loose when moist. pH 5.9.<br>Gradual boundary: |
| Cg2 | 13 + | Sand and gravel of variegated colour. Occasional roots in upper part. Single-grained. pH 6.0. |

### Land Use

Most of the Sardis soils are unreclaimed and used for rough pasture. The coarse texture of these soils makes them poor agricultural land because of low moisture holding capacity and low nutrient status. These soils are subject to flooding during periods of heavy rainfall. By use of irrigation when required and fertilization, these soils are fair for forage and pasture production. Access is often difficult since these soils frequently occur at the bottom of deep ravines and gullies.

## ORGANIC SOILS

These are soils which contain 30 percent or more organic matter and have a depth of 12 inches or more of consolidated organic material. They are very poorly drained and the water table is at or near the surface for substantial parts of the year.

The wet environment delayed decomposition of organic matter so that the rate of accumulation has been faster than the rate of decay. Remains of sedge, reeds, wood, and moss are the chief components of the organic material. Degree of decomposition is variable, ranging from well decomposed muck in which individual plant remains are unrecognizable to raw peat in which individual leaves, roots, stems, etc., are easily identified.

Muck soils are the only organic soils occurring on the uplands of Langley Municipality.

### Muck Soils

These soils are very poorly drained and have well decomposed surface horizons in which individual plant remains cannot be identified. Subsurface organic horizons may be at various stages of decomposition. Underlying mineral strata are usually extremely gleyed.

Judson muck was the only Muck soil classified on the uplands of Langley Municipality.

### Judson Muck

The Judson muck occupies scattered depressional and seepage areas throughout the uplands of Langley Municipality. Topography is level with minor areas very gently undulating. Elevations range from 50 to 300 feet. Often Judson muck is associated with poorly drained soils such as the Ross, Scat, and Lehman series. Acreages of Judson muck and Judson muck:shallow phase total 867 acres while an additional 1,190 acres are mapped as soil complexes in which Judson muck is dominant.

This soil has developed from an accumulation of organic material consisting mainly of reeds, sedge, wood, and moss from 12 to 60 or more inches deep. The surface layer has humified to muck. Underlying organic strata vary from semi-decomposed peat to well decomposed muck. A few areas under natural conditions support a living sphagnum moss surface. Generally, the organic material is underlain by fine textured, slowly permeable, strongly gleyed mineral material. However, in areas where the Judson muck is associated with the Lehman series the mineral material may be coarse textured. Areas where the depth of organic material exceeds 24 inches are mapped as Judson muck; areas with 12 to 24 inches of organic deposits are designated Judson muck:shallow phase.

Natural vegetation consists of alder, birch, shore pine, willow, hardhack, sweet gale, labrador tea, and sphagnum moss. A profile was examined in a pasture field one-half mile east and 200 yards north of the North Bluff-Biggar roads intersection. Vegetation at the site consists of orchard and reed canary grass, hardhack, sedge, Canada thistle, and scattered willow and birch. The profile was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Hp | 0 - 5 | Black to dark reddish brown (5YR 2/1.5, moist and dry) muck. Moderate, medium, subangular blocky structure. Very friable to friable when moist. Abundant roots. pH 3.8.<br>Abrupt boundary: |
| humic<br>H1 | 5 -11 | Black to very dusky red (5YR 2/1 - 2.5YR 2/2, moist) muck. Vertical cracks two to four inches apart. Friable to firm when moist. hard when dry. Very abundant roots along cracks. pH 3.9.<br>Clear boundary: |
| H2 | 11 -17<br>11-17 humic | Dark reddish brown (5YR 2/2, moist) muck. Moderate, coarse, subangular blocky structure. Friable to firm when moist, hard when dry. Abundant roots in upper part, common in lower part. pH 4.1.<br>Clear boundary: |
| FL1 | 17 -21<br>mesic | Dark reddish brown (5YR 2/2, moist) weakly stratified semi-decomposed organic material, mainly reeds and sedge. Common roots. pH 4.3.<br>Gradual boundary: |

Fibric Mesisol - humic, udic family, Judson series

| Horizon | Depth Inches | Description |
|---|---|---|
| FL2 | 21 -33<br>sapric | Dark reddish brown (5YR 2/2, moist) stratified semi-decomposed to raw organic material, mainly reeds and sedge. Numerous old tree roots. Occasional roots in upper part. pH 4.5. Diffuse boundary: |
| LF | 33 -46<br>mesic<br>36-41 mesic | Dark reddish brown (5YR 2/2-3/3, moist) stratified, undecomposed to semi-decomposed fibrous organic material. Numerous vertical, dead roots hold mass together. pH 4.7. Diffuse boundary: |
| L1 | 46 -64<br>fibric | Brown to dark-brown (7.5YR 4/4, moist) stratified, undecomposed, fibrous organic material. Numerous vertical, dead roots hold mass together. pH 5.0. Diffuse boundary: |
| L2 | 64 +<br>fibric | Reddish-brown (5YR 4/4, moist) stratified, undecomposed, fibrous organic material. Numerous vertical, dead roots hold mass together. pH 5.1. |

## Land Use

The major portion of the Judson muck is still unreclaimed; those portions which are cultivated are planted to pasture and hay. The forage produced is of low feed value due to high content of sedge and other unpalatable plants. Only grasses such as reed canarygrass which can withstand the poor drainage produce satisfactory yields.

The Judson muck often is difficult to reclaim inasmuch as the areas occupy seepages, low depressions, and areas along streams. Flat topography and scarcity of outlets make gravity drainage difficult. Clearing costs are high.

When drained, the water table should be controlled so that the surface layer does not dry excessively, a condition which promotes subsidence and cracking. If well managed, Judson muck is valuable for vegetable and blueberry production.

A suggested reclamation procedure is outlined on page 112 of this report.

## Lowland Soils

## HUMIC GLEYSOL SOILS

For a generalized description of Humic Gleysol soils, refer to page 59 of this report.

On the lowlands of Langley Municipality and on Barnston Island the Orthic Humic Gleysol and Rego Humic Gleysol subgroups of Humic Gleysol soils were differentiated.

### Orthic Humic Gleysol Soils

This subgroup consists of poorly drained soils having a dark coloured surface Ah horizon greater than three inches deep underlain by gleyed and mottled Bg and Cg. These soils may exhibit weakly developed eluvial and/or illuvial characteristics. Up to 12 inches of organic material may be present on the surface.

On the lowland area, this subgroup is represented by the Hazelwood series.

### Rego Humic Gleysol Soils

For a generalized description of Rego Humic Gleysol soils, refer to page 59 of this report.

This subgroup of soils is represented in the lowland areas by the Hjorth, Katzie, Westlang, Sim, and Niven series.

### Orthic Humic Gleysol Soils

### Hazelwood Series

The Hazelwood soils occur only in Glen Valley at elevations near 15 feet. The topography varies from level to undulating with slopes of one to five percent. Thirty-seven acres were mapped as Hazelwood silty clay loam and an additional 105 acres are occupied by several soil complexes in which the Hazelwood soil occupies the largest acreage.

The parent material consists mainly of Fraser River sediments deposited by vertical accretion. During floodstage, the river load of fine materials was carried into ponds, where it settled on the bottom. Surface textures are usually silty clay loam with occasional variation to silt loam and silty clay. A silty clay Btg horizon is common in all areas.

This poorly drained soil has been classified as an Orthic Humic Gleysol. Water percolation, particularly through the Btg horizon, is very slow and the water table remains near the soil surface most of the winter. The Hazelwood soils have an Ah horizon high in organic matter, and in some areas there is a buried IIAh horizon. In the few remaining uncleared areas, the vegetation consists of cottonwood, alder, vine maple, and scattered cedar with an undergrowth of thimbleberry, blackberry, nettles, thistle, and grasses. A cultivated profile, located about 200 yards northeast of the Clayburn-Bell roads junction in Matsqui Municipality is representative of this soil and has the following description:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 9 | Dark-gray (10YR 4.5/1, dry) or black to very dark brown (10YR 2.5/1, moist) silty clay loam. Weak, medium, subangular blocky breaking to medium granular structure. Friable when moist. Common roots. pH 4.7.<br>Abrupt boundary: |
| AB | 9 -14 | Gray (2.5Y 4.5/0, dry) or very dark gray to dark-gray (2.5Y 3.5/0, moist) silty clay loam. Strong, medium, blocky structure. Very firm when moist. Occasional roots. pH 5.0.<br>Abrupt boundary: |
| Btg | 14 -24 | Light-gray (2.5Y 7/0, dry) or gray (10YR 5/1, moist) silty clay. Strong, coarse prismatic breaking to coarse, blocky structure. Organic matter and clay coatings on prism surfaces and organic matter deposits in cracks between prisms. Many, medium, distinct, reddish-brown (5YR 4/4, moist) mottles. Extremely firm when moist. pH 5.1.<br>Gradual boundary: |
| Cg | 24 -29 | Light-gray (7.5YR 7/0, dry) or gray (10YR 5.5/1, moist) silty clay loam. Massive. Many, medium, distinct, reddish-brown (5YR 4/4, moist) mottles. Very firm when moist. pH 5.5.<br>Gradual boundary: |
| IICg1 | 29 -36 | Light-gray (10YR 7/1, dry) or gray to grayish-brown (10YR 5/1.5, moist) very fine sandy loam. Massive. Few, medium, distinct, yellowish-brown (10YR 5/6, moist) mottles. Very friable |

| Horizon | Depth Inches | Description |
|---|---|---|
| | | when moist. pH 5.6.<br>Gradual boundary: |
| IICg2 | 36 + | Loamy sand of variegated colours. Single-grained. Loose when moist. Few, medium, distinct, mottles. pH 5.9. |

## Land Use

In Langley Municipality all the Hazelwood soils are used for producting hay and pasture crops. Saturation of the soil profile for long periods during the winter months usually damages the perennial forages, particularly clovers, and the sward often contains high amounts of sedge and other unpalatable species.

Installation of tile drainage will lower the water table and increase rooting depth, thereby permitting the maintenance of better forage stands.

During dry seasons, a few irrigations are beneficial. Even though this soil has high moisture holding capacity, the restricted rooting depth does not allow the roots to penetrate to subsoil moisture.

## Rego Humic Gleysol Soils

### Hjorth Series

Hjorth soils occur on the Fraser River floodplain in the northern part of Langley Municipality and on Barnston Island, frequently associated with the Fairfield series. The topography is gently sloping and undulating with gradients from two to six percent. Elevations range from eight to 15 feet above sea level. Seventy-four acres of Hjorth silt loam, 127 acres of Hjorth silty clay loam and an additional 74 acres of two soil complexes dominated by the Hjorth series were mapped.

Lateral accretion deposits of the Fraser River form the parent material of this soil. Surface textures vary from silt loam to silty clay loam and grade into fine to medium sand at depth. Drainage is poor to moderately poor and in undyked areas is subject to flooding during the freshet season.

The Hjorth soils are classified as Rego Humic Gleysols. The profile has a dark coloured surface horizon containing accumulated organic material and a gleyed and mottled subsoil. Native vegetation is mainly deciduous consisting of cottonwood, willow and alder with scattered cedar and spruce. Shrub cover is dense and a light ground cover of sedge and moss exists. A cultivated profile located near the eastern end of Barnston Island was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 8 | Dark-gray (10YR 4/1, dry) or black to very dark brown (10YR 2/1.5, moist) silty clay loam. Moderate, medium, subangular blocky structure. Firm when moist. Abundant roots. pH 5.5.<br>Abrupt boundary: |
| Cg1 | 8 -15 | Brown to dark-brown (10YR 4/3, moist) silty clay loam. Moderate, medium, psuedo-subangular blocky structure. Many, fine, distinct, yellowish-red (5YR 4/6-5/8, moist) mottles. Firm when moist. Abundant roots in upper part, common in lower part. pH 5.9.<br>Clear boundary: |
| Cg2 | 15 -23 | Grayish-brown (2.5Y 5/2, moist) silty clay loam. Massive. Common, medium, distinct, strong-brown (7.5YR 5/6-5/8, moist) mottles. Firm when moist. Occasional roots. pH 6.0.<br>Gradual boundary: |
| Cg3 | 23 -37 | Grayish-brown (2.5Y 5/2, moist) silty clay loam. Massive. Many, medium, prominent, yellowish-red (5YR 4/6, moist) mottles. Firm when moist. Occasional roots. pH 5.9.<br>Abrupt boundary: |
| IICg | 37 + | Dark-gray (10YR 4/1, moist) fine sandy loam or loamy fine sand. Compact, breaking to single-grained. Many, coarse, distinct, dark reddish brown (5YR 3/3.5, moist) mottles. Very friable when moist. pH 5.8. |

## Land Use

All cleared areas of Hjorth soils are presently used for hay and pasture production. Forage yields are fair although the poor drainage tends to kill the legumes. Drainage installation is required to control the high water table that exists during the winter and freshet season of the Fraser River. Location of drainage outlets may sometimes be difficult because the Hjorth soils are usually depressional in relation to surrounding land. Organic matter content of the soil is relatively high and most plant nutrients are available in moderate amounts.

## Niven Series

This soil occupies scattered areas in the northern part of Langley Municipality and on Barnston Island. It represents the transition area between the organic and mineral soils of the Fraser River floodplain. The topography is very gently sloping and undulating with slopes up to three percent. Elevations are from eight to fifteen feet. Sixty-eight acres of Niven silty clay loam and an additional 181 acres of two soil complexes dominated by Niven soils were mapped.

The parent material consists of fine textured Fraser floodplain sediments which overlie organic deposits for depths of 15 to 30 inches. Mineral-organic interstratification usually occurs at the boundary between the organic and mineral deposits. Surface textures vary from silt loam to silty clay loam. During periods of flooding the mineral material settled out of stagnant water which covered the organic deposits.

The Niven soils are poorly to very poorly drained and are dominantly Rego Humic Gleysols. Minor Rego Gleysol soils are also included. Native vegetation is composed of alder, vine maple, cedar, willow, skunk cabbage, nettles, sedge, and others. A cultivated profile in the northeast part of Barnston Island was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 5 | Grayish-brown (2.5Y 5/2, dry) or dark-gray to gray (5Y 4.5/1, moist) silty clay loam. Moderate, coarse, subangular blocky structure. Common, fine, distinct, brown to dark-brown (7.5YR 4/4, moist) mottles. Very firm when moist. Abundant roots. pH 5.2.<br>Clear boundary: |
| Cg1 | 5 - 8 | Gray (5Y 5/1, moist) silty clay loam. Breaks to moderate, coarse, psuedo-subangular blocky structure. Common, fine, prominent, dark-brown (7.5YR 4/4, moist) mottles. Very firm when moist. Abundant roots. pH 5.2.<br>Clear boundary: |
| Cg2 | 8 -12 | Gray (5Y 5/1, moist) silty clay loam. Several thin organic bands between layers of mineral material. Common, fine, prominent, strong-brown (7.5YR 5/6, moist) mottles. Very firm when moist. Occasional vertical cracks. Abundant roots in upper part, common in lower part. pH 5.2.<br>Clear boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| H & Cg | 12 -17 | Numerous alternating layers of very dark brown (10YR 2/2, moist) muck and gray (5Y 5/1, moist) silty clay loam. Mineral material strongly gleyed. Occasional vertical cracks. Firm when moist. Common roots. pH 5.2. Gradual boundary: |
| FH1 | 17 -21 | Very dark brown to very dark grayish brown (10YR 2.5/2, moist) partly to well decomposed organic material. Firm when moist. Occasional roots in upper part. Gradual boundary: |
| FH2 | 21 -27 | Dark-brown (10YR 3/3, moist) partly to well decomposed organic material. Massive. Firm when moist. Gradual boundary: |
| L & Cg | 27 + | Numerous alternate layers of peat and silty clay loam. Mineral material strongly gleyed. Firm when moist. |

## Land Use

Most of the Niven soils are presently used for hay and pasture, with one area used by a canning company for pole beans, pumpkins and cucumbers. The comparatively level topography is desirable for crops that require uniform maturity. Drainage is poor to very poor and tiling is required to control the water table. To protect against undue subsidence of the underlying organic material, the water table should not be lowered anymore than necessary for good crop growth. A controlled water table will supply additional subsoil moisture, thereby lessening the need for irrigation during dry summers.

The levels of organic matter in the surface horizons are variable but nitrogen response can be expected. Cultivation takes considerable power because of the heavy texture and sticky consistence.

## Katzie Series

The Katzie series occurs only on the lowlands in the vicinity of Fort Langley and in the northwestern corner of Langley Municipality between elevations of 15 to 20 feet. Topography is gently to moderately undulating with slopes from 2 to 8 percent. Fifty-three acres were mapped as Katzie silty clay loam, and 174 acres as Katzie silty clay loam-silt loam. An additional 44 acres are occupied by Katzie-Niven soil complexes.

This soil occurs mainly on the higher levees of the Salmon River and other occupied and abandoned stream channels which originate on the Cloverdale marine deposits. The parent material consists of a mixture of reworked marine and Fraser River sediments deposited during flood stages of the streams and the Fraser River. Surface textures are usually silty clay loam with minor variations to silt loam and silty clay.

The Katzie series, a Rego Humic Gleysol soil, is moderately poorly to poorly drained depending on the position and height of the levees. Surface runoff is satisfactory but internal drainage is slow due to the heavy texture and massive nature of the subsoil. When dry, cracks up to one-half inch wide develop and extend downward from below the Ah horizon. The Ah horizon, usually high in organic matter may be up to 18 inches deep although usually the depth is approximately 12 inches.

Native vegetation is dominated by willow and cottonwood in the few areas not yet cleared. A profile, located in a pasture near the Salmon River south of Fort Langley, was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 8 | Very dark gray to dark-gray (10YR 3.5/1, moist) or black (10YR 2/1, moist) silty clay loam. Moderate, medium, subangular blocky breaking to moderate, medium, granular structure. Friable to firm when moist. Abundant roots. pH 5.5.<br>Abrupt boundary: |
| Ah | 8 -15 | Gray (10YR 5.5/1, moist) or very dark brown to very dark gray (10YR 2/2-3/1, moist) silty clay loam or silty clay. Moderate, coarse, subangular blocky structure. Firm when moist. Abundant to common roots. pH 5.5.<br>Abrupt boundary: |
| Cg1 | 15 -22 | Grayish-brown to dark grayish brown (2.5Y 5/2 - 10YR 4/2, moist) silty clay. Massive. Common to many, fine, distinct, strong-brown (7.5YR 5/6-5/8, moist) mottles. Very firm when moist. Occasional to common roots, mainly along vertical cracks. pH 5.7.<br>Gradual boundary: |
| Cg2 | 22 -32 | Gray to olive-gray (5Y 5/1.5, moist) silty clay. Massive. Many, fine to medium, prominent, strong-brown (7.5YR 5/6, moist) mottles. Very |

| Horizon | Depth Inches | Description |
|---|---|---|
| | | firm when moist. Occasional roots along vertical cracks. pH 5.9.<br>Diffuse boundary: |
| Cg3 | 32 -43 | Olive-gray (5Y 5/2, moist) silty clay or clay. Massive. Common to many, medium, prominent, strong-brown to yellowish-red (7.5YR 5/6 - 5YR 5/8, moist) mottles. Very firm when moist. Occasional roots in upper part along vertical cracks. pH 6.1.<br>Diffuse boundary: |
| Cg4 | 43 + | Gray (5Y 5/1, moist) silty clay. Massive. Many, medium, prominent, strong-brown (7.5YR 5/6, moist) mottles. Very firm when moist. pH 6.3. |

## Land Use

Most of the Katzie soils are utilized for pasture and hay production although some oats are also grown. Yields are good and most of the clovers survive quite well especially near and on the tops of the levees. Moisture holding capacity of this soil is high, making irrigation necessary only during exceptionally dry summers. Tile drainage is required only on the lower levee slopes which are susceptible to flooding during periods of heavy rainfall.

The irregular pattern and small areas makes this soil difficult to manage separately and therefore is generally treated similarly to the surrounding soil, usually the Westlang series.

## Westlang Series

The Westlang soils occur only on the lowlands in the vicinity of Fort Langley and in the northwest corner of Langley Municipality between elevations of 10 to 15 feet. They usually occupy depressional areas having level to gently undulating topography. Slopes range from one to five percent. Westlang silty clay loam occupies 491 acres and soil complexes dominated by the Westlang series occur on an additional 205 acres.

The parent material is similar to that of the Katzie series, being a mixture of reworked marine and Fraser River sediments. These sediments settled from still water flooded into depressional areas during flooding of the Fraser River and streams originating on the Cloverdale marine deposits. Surface textures are silty clay loam with variations to silty clay and are commonly underlain by a dense, clay textured subsoil. When dry, vertical cracks 6 to 12 inches apart are prominent in the subsoil.

This Rego Humic Gleysol soil is poorly to very poorly drained. Surface as well as internal water movement is very slow and the water table is at or near the soil surface for large parts of the year. Native vegetation, presently almost all cleared, was mainly willow, cottonwood, sedge, and other water tolerant species. A profile, located in a pasture southwest of Fort Langley was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 6 | Gray (10YR 5/1, dry) or very dark gray (10YR 3/1, moist) silty clay. Moderate to strong, very coarse, subangular blocky breaking to strong, medium to fine, subangular blocky structure. Few, fine, faint mottles. Very firm when moist. Abundant roots. pH 5.8.<br>Abrupt boundary: |
| CA | 6 -14 | Dark-gray (5Y 4/1, moist) clay. Stratified and breaks to strong, very thick, psuedoplaty structure along several, thin buried Ah horizons. Common, fine to medium, prominent, yellowish-red (5YR 4/6, moist) mottles. Very to extremely firm when moist. Abundant to common roots. pH 5.8.<br>Gradual boundary: |
| Cg1 | 14 -23 | Dark-gray (5Y 4/1, moist) clay. Massive. Common, fine to medium, prominent, yellowish-red (5YR 4/8, moist) mottles. Organic matter in cracks which are 6 to 12 inches apart. Very to extremely firm when moist. Common to abundant roots along cracks, occasional roots within peds. pH 6.0.<br>Gradual boundary: |
| Cg2 | 23 -34 | Dark-gray to gray (5Y 4.5/1, moist) clay. Massive. Common, medium, prominent, yellowish-red (5YR 4/6-4/8, moist) mottles. Very to extremely firm when moist. Common roots along cracks, occasional roots in peds. pH 6.0.<br>Gradual boundary: |
| Cg3 | 34 + | Dark-gray (N 4/ - 5Y 4/1, moist) silt loam or silty clay loam. Massive. Few to common, medium, distinct, yellowish-brown to dark |

| Horizon | Depth Inches | Description |
|---|---|---|
| | | yellowish brown (10YR 4.5/4, moist) mottles along old root channels. Firm when moist. Common to occasional roots along cracks, occasional roots in peds. pH 5.8. |

Land Use

Most of the acreage of Westlang soils has been cleared and is used for pasture and hay production. Clovers in the sward soon die due to the poor drainage and are replaced by sedge and other moisture resistant species.

Poor drainage is the most restricting feature in this soil for agricultural use, and could be substantially improved by installation of tile drainage. Tiling would also improve the aeration and structure of the massive, heavy textured subsoil, thereby increasing the rooting depth.

Water holding capacity of this soil is good and irrigation is generally not required. Ponding frequently occurs during periods of heavy rainfall.

Power requirements for cultivation are high due to the heavy textures. Cultivation should be undertaken at the correct moisture content; puddling occurs if cultivated when wet, whereas if cultivated too dry, the soil breaks into clods difficult to break down.

## Sim Series

The Sim series occurs only in Glen Valley where 49 acres were mapped. An additional 104 acres are occupied by two soil complexes in which the Sim series is the dominant member. The topography is usually gently undulating with slopes up to three percent and elevations lie between 10 and 20 feet.

The parent material of this soil consists of alluvial materials deposited by streams originating in the glacio-marine uplands. During periods of heavy rainfall these streams overflow, and deposit sediments in the form of levees. These levees obtain thicknesses of four or more feet and overlie Fraser floodplain deposits. Surface textures range from silt loam to silty clay, commonly becoming slightly coarser with depth. In some areas, a mucky organic layer, up to 6 inches thick, occurs in the profile.

This poorly drained soil is classified as a Rego Humic Gleysol. Most areas are presently cleared; small uncleared patches indicate a native vegetation of cottonwood, alder, willow, blackberry, thimbleberry, nettles, sedges, and others. A cultivated profile examined west of Jackman Road in Glen Valley was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 8 | Gray to dark-gray (10YR 4.5/1, dry) or very dark gray to black (10YR 2.5/1, moist) silty clay. Moderate, medium to fine subangular blocky structure. Firm when moist. Abundant roots. pH 5.2.<br>Abrupt boundary: |
| Cg1 | 8 -11 | Light brownish gray (2.5Y 6/2, dry) or grayish-brown (2.5Y 5/2, moist) silty clay. Moderate, medium, psuedo-subangular blocky structure. Few to common, fine, prominent, yellowish-red (5YR 4/6, moist) mottles. Firm to very firm when moist. Abundant roots. pH 5.4.<br>Clear boundary: |
| Cg2 | 11 -19 | Dark-gray (5Y 4/1, moist) silty clay. Breaks to strong, coarse to medium, psuedo-subangular blocky structure. Common, fine to medium, prominent, reddish-brown to yellowish-red (5YR 4/4-4/6, moist) mottles, mainly around old root channels. Very firm when moist. Common roots, concentrated mainly along vertical cracks. pH 5.4.<br>Gradual boundary: |
| Cg3 | 19 -26 | Gray to dark-gray (5Y 4.5/1, moist) silty clay loam. Breaks to strong, coarse, psuedo-subangular blocky structure. Common, medium, prominent, yellowish-red (5YR 4/7, moist) mottles, mainly along old root channels. Very firm when moist. Common to occasional roots, mainly along vertical cracks. pH 5.2.<br>Diffuse boundary: |
| Cg4 | 26 -36 | Gray (5Y 5/1, moist) silty clay loam. Massive. Common to many, medium, prominent, yellowish-red to strong-brown (5YR 4/6 - 7.5YR 5/6, moist) mottles. Firm when moist. Occasional roots. pH 5.2.<br>Diffuse boundary: |
| Cg5 | 36 + | Olive-gray to gray (5Y 5/1.5, moist) silt loam. Massive structure. Common, medium, prominent, yellowish-red (5YR 4/8, moist) mottles. Firm when moist. Occasional roots |

| Horizon | Depth Inches | Description |
|---|---|---|
| | | in upper part. pH 5.7. |

## Land Use

Hay and pasture are the usual crops grown on this soil. Clovers soon die due to poor drainage and are replaced by sedge, thistle and other unpalatable species. Removal of excess water by installing tile drainage would increase yields. During periods of heavy rainfall, ponding occurs on the lower levee slopes.

Moisture-holding capacity is high and supplemental irrigation is required only during drier than average summers.

## GLEYSOL SOILS

These soils have developed under poor to very poor drainage conditions. A dark coloured surface horizon less than three inches thick may be present under virgin conditions; when cultivated the plow layer (Ap) is gray to grayish-brown in colour. Underlying horizons are strongly gleyed and mottled and may exhibit eluvial or illuvial characteristics. Up to 12 inches of organic material may occur on the surface. The Rego Gleysol subgroup was the only Gleysol soil distinguished in the lowland area.

### Rego Gleysol Soils

These soils have a dark coloured Ah horizon not more than three inches thick and/or organic surface not more than 12 inches thick. Underlying Cg horizons show no eluvial or illuvial characteristics but are strongly gleyed and mottled. Rego Gleysol soils are represented on the lowland by the Page, Prest, Annis, Hallert, McElvee, and Sardis soil series.

### Page Series

The Page soils occur on the Fraser River floodplain in the northern part of Langley Municipality and on Barnston Island, between elevations of 10 to 18 feet. Topography is undulating with slopes from two to six percent. Twenty-one acres of Page series, 103 acres of Page silt loam, 30 acres of Page:shallow phase, and a further 239 acres of several soil complexes dominated by Page soils were differentiated.

The Page soils have developed from lateral accretion deposits of the Fraser River. These deposits have ridge and swale relief, and the

Page soils occupy an intermediate position between the imperfectly drained Fairfield and very poorly drained Prest series. Surface textures are silty clay loam or silt loam. At depth, medium to fine sands are encountered. Where the depth to the sands is less than 18 inches, the soil is mapped as Page:shallow phase.

The Page series is classified as a poorly drained Rego Gleysol soil. During the winter the profile is saturated and frequently covered with shallow water. During the growing season, however, and especially after high water on the Fraser River, the surface horizon is usually free of excess moisture. In undisturbed areas native vegetation consists of willow, birch, skunk cabbage, sedge, reed canary grass, and others. A cultivated profile, located near the western end of Barnston Island was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 7 | Light brownish gray (2.5Y 6/2, dry) or dark grayish brown to dark-brown (10YR 4/2.5, moist) silty clay loam. Moderate, medium, subangular blocky breaking to weak, medium, granular structure. Few, fine faint mottles. Firm when moist. Abundant roots. pH 5.2.<br>Abrupt boundary: |
| Cg1 | 7 -13 | Grayish-brown (10YR 5/2, moist) silty clay loam. Moderate, medium, psuedo-subangular blocky structure. Common, medium, distinct, reddish-brown (5YR 4.5/4, moist) mottles. Firm when moist. Common roots. pH 5.5.<br>Clear boundary: |
| Cg2 | 13 -19 | Grayish-brown (2.5Y 5/2, moist) silty clay loam. Massive. Many, medium, distinct, strong-brown to dark-brown (7.5YR 5/6-4/4, moist) mottles. Firm when moist. Occasional roots. pH 5.5.<br>Clear boundary: |
| Cg3 | 19 -26 | Grayish-brown (2.5Y 5/2, moist) silt loam. Massive. Many, medium, distinct, strong-brown to dark-brown (7.5YR 5/6-4/4, moist) mottles. Friable when moist. Occasional roots. pH 5.7.<br>Abrupt boundary: |
| Cg4 | 26 -34 | Dark grayish brown (2.5Y 4/2, moist) fine sandy loam. Massive. Many, medium, prominent, strong-brown to dark reddish brown (7.5YR 5/6 - 2.5YR 3/4, moist) mottles. Friable when moist. Occasional roots. pH 5.7.<br>Clear boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Cg5 | 34 -39 | Very dark grayish brown (2.5Y 3/2, moist) silt loam. Massive. Many, medium, prominent, yellowish-red (5YR 4/8, moist) mottles. Firm when moist. pH 5.7.<br>Abrupt boundary: |
| IICg | 39 + | Grayish-brown to dark grayish brown (10YR 4.5/2, moist) fine sand or loamy fine sand. Weakly compact, breaking to single-grained. Many, coarse, faint, dark-brown (10YR 3/3, moist) mottles. Very friable when moist. pH 5.7. |

### Land Use

The Page soils are presently used for forage and pasture production. Yields generally are satisfactory although legumes soon die due to poor drainage. Because Page soils usually occur in association with other soils of varying drainage, they are unsuited for crops which require uniform maturity.

Drainage installations are required to control the water table during the winter months and freshet season of the Fraser River. Wetness and heavy texture delay spring cultivation. These soils have a high water holding capacity and only during very dry summers is supplemental irrigation required. Manuring and green manure crops are required to improve the organic matter content of the surface horizons.

## Prest Series

The Prest series occurs only in the northern part of Langley Municipality and on Barnston Island. This soil occupies small, depressional areas between elevations of eight to twelve feet. A total of 69 acres were mapped as Prest series and an additional 76 acres were classified in two soil complexes in which the Prest series is dominant.

These soils occur in the lowest depressional areas in the lateral accretion deposits of the Fraser River. They are very poorly drained and the water table is at or near the soil surface for most of the year. Surface textures vary from silty clay loam to silty clay and in a few areas several inches of peat occur on the surface.

The very poorly drained Prest soil, classified as a Rego Gleysol, supports a native vegetation consisting mainly of sedge, reed canary grass, watercress, reeds, and other water tolerant species. An undisturbed profile, representative of this soil, was described in Matsqui Municipality as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | 3 - 0 | Undecomposed organic matter. pH 4.5. |
| Cg1 | 0 -10 | Light-gray (5Y 7/1, dry) or grayish-brown (10YR 5/2, moist) silty clay loam. Moderate, coarse, psuedo-subangular blocky structure. Many, coarse, prominent, dark-red (2.5YR 3/6, moist) mottles. Very firm when moist. Common roots. pH 5.3.<br>Clear boundary: |
| Cg2 | 10 -18 | Light-gray (5Y 6/1, dry) or gray (5Y 5/1, moist) silty clay. Massive. Common, distinct, yellowish-brown (10YR 5/6-5/6, moist) mottles. Very firm when moist. Occasional roots. pH 5.7.<br>Abrupt boundary: |
| IICg | 18 -27 | Light-gray to gray (5Y 5.5/1, dry) or very dark gray to dark-gray (2.5Y 3.5/0, moist) loamy fine sand. Single-grained. Very friable when moist. pH 6.3.<br>Abrupt boundary: |
| Cg3 | 27 + | Gray (2.5Y 5/0, moist) silt loam. Massive. Firm when moist. pH 6.3. |

### Land Use

These soils occupy very poorly drained depressions and frequently are nonarable because of the high water table. Installation of drains greatly increase the suitability of these soils for forage and hay crops but the small areas in question and the difficulty in locating outlets frequently does not warrant the cost. In such cases, reed canary grass or other water tolerant crops should be planted to produce permanent pasture. Smaller depressions may be partially filled by levelling the surrounding soils.

## Annis Series

This soil occupies minor acreages in the lowland portions of the map-area at elevations between 8 and 12 feet. The topography is level to very gently undulating and often is depressional. At other times it occurs near the boundary between mineral and organic soils. Fifty-four acres of Annis series and 110 acres of soil complexes dominated by Annis soils were mapped.

Six to twelve inches of well decomposed organic material overlying silty clay loam to silty clay textured floodplain deposits forms the parent material of this soil. Drainage is very poor and the subsoil is strongly gleyed.

Annis series, classified as a Rego Gleysol, developed under a natural vegetation of scattered cedar, alder, willow, and hemlock with an understory of hardhack and sedges. A representative profile, located in a cultivated field in Matsqui Prairie, was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Hp | 10 - 2 | Very dark gray to dark-gray (10YR 3.5/1, dry) or very dark brown (10YR 2/2, moist) muck. Very friable when moist. Abundant roots. pH 5.2. Abrupt boundary: |
| FH | 2 - 0 | Brown to dark-brown (10YR 3.5/3, dry) or dark-brown (7.5YR 3/2, moist) peaty muck. Fibrous. Common roots. pH 4.7. Abrupt boundary: |
| Cg1 | 0 - 4 | Light-gray (10YR 6.5/1, dry) or dark-gray (10YR 4/1, moist) silty clay loam. Massive. Few, fine, faint, mottles. Firm when moist. Occasional roots. pH 5.1. Clear boundary: |
| Cg2 | 4 - 8 | Light-gray (10YR 6.5/1, dry) or dark-gray (10YR 4/1, moist) silty clay. Massive. Common, fine, distinct, strong-brown (7.5YR 5/6, moist) mottles. Very firm when moist. Occasional roots. pH 5.4. Clear boundary: |
| Cg3 | 8 + | Pale-brown (10YR 6/3, dry) or gray-brown (2.5Y 4/2, moist) silty clay loam. Massive. Many, medium, distinct, strong-brown (7.5YR 5/6, moist) mottles. Very firm when moist. Occasional roots. pH 6.1. |

## Land Use

Though most of the Annis soils are cultivated, satisfactory crop production is dependent on adequate drainage. Clovers soon die because of poor drainage and flooding and are replaced by sedges, buttercups and other weeds. However, annual crops such as oats and vegetables, produce satisfactory yields.

These are friable, fertile soils which are greatly restricted in use by poor drainage. Water holding capcities are high although during dry seasons supplemental irrigation is beneficial.

## Hallert Series

The Hallert series is situated on the Fraser floodplain in northern Langley Municipality and on Barnston Island at elevations between eight and 15 feet. The level to very gently sloping and undulating topography is somewhat depressional in relation to the surrounding mineral soils. Two hundred and twenty acres of Hallert series and an additional 97 acres of two soil complexes in which Hallert soils predominate were mapped.

The Hallert series is derived from a mixture of Fraser floodplain and swamp deposits. The fine textured mineral sediments were deposited largely by vertical accretion in shallow ponds formed during exceptional freshets. Between these intermittant depositions organic matter accumulated and in turn was buried. Over many years this process produced a soil profile of alternating bands of organic and mineral material. The bands vary in thickness indicating different river loads of mineral material and variable periods of time between depositions which allowed for accumulation of organic material. Surface textures are usually muck; minor areas are silt loam. In some areas the organic layers are thin, in others the silt bands are thin. In places the soil profile is underlain by water saturated peat or muck.

This soil is a very poorly drained Rego Gleysol. The water table is at or near the surface for most of the winter and early spring. Under native conditions the vegetation is swamp forest consisting of alder, birch, willow, cedar, hardhack, sedge, and others. A cultivated profile near the center of Barnston Island was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Hp | 9 - 3 | Very dark grayish brown to dark-gray (10YR 3/2-4/1, dry) or very dark brown (10YR 2/2, moist) muck. Weak, medium, subangular blocky breaking to weak, medium, granular structure. Very friable when moist. Abundant roots. pH 4.0.<br>Abrupt boundary: |
| H | 3 - 0 | Very dusky red to very dark brown (2.5YR 2/2 - 10YR 2/2, moist) muck. Weak, thin, platy structure. Firm when moist, hard when dry. Abundant roots. pH 4.2.<br>Abrupt boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Cg | 0 -13 | Dark grayish brown to brown (10YR 3/2 - 7.5YR 4/2, moist) silty clay loam. Breaks to moderate, medium to coarse psuedo-subangular blocky structure. Scattered thin bands of organic material. Occasional vertical cracks through horizon. Firm when moist. Common roots in upper part, occasional in lower part. pH 4.9.<br>Clear boundary: |
| F | 13 -18 | Dark-brown (10YR 3/3, moist) partly decomposed material with silt disseminated throughout. Massive. Occasional roots. pH 4.9.<br>Gradual boundary: |
| L and Cg | 18 -31 | Dark grayish brown to very dark grayish brown (10YR 3.5/2, moist) weakly stratified undecomposed peat containing numerous very thin bands of silt. pH 5.0.<br>Gradual boundary: |
| L | 31 -43 | Stratified, undecomposed fibrous peat of variegated colour. Old roots penetrating horizon vertically hold mass together. pH 4.9.<br>Clear boundary: |
| Cg and L | 43 + | Gray to greenish-gray (5Y 5/1 - 5GY 5/1, moist) alternating bands of silty clay loam and undecomposed peat. pH 5.1. |

## Land Use

Most of the acreage is presently used for hay and pasture production. Legumes are short lived because of poor drainage and are replaced by water tolerant species such as sedge and buttercup. A minor acreage is used for vegetables which do well if the soil is adequately drained. Blueberries are also suited for these soils.

Because of the level to depressional topography, ponding occurs during periods of heavy rainfall and artificial drainage is required. During dry summers supplemental irrigation is beneficial.

## McElvee Series

The McElvee series occupies a minor acreage in Glen Valley between 10 to 20 feet elevations. The gently undulating topography has slopes from two to five percent. Nineteen acres of McElvee series and an additional 176 acres of several soil complexes in which this series occupies the major part were classified.

Alluvium deposited by streams originating on the upland form the parent material of this soil. The sediments, mainly eroded from glacio-marine materials, were laid down as levees along present and former stream courses. Surface textures generally are silt loam or silty clay loam although loam also occurs. Sand substrata occur at various depths, and, where the sands are less than 18 inches below the soil surface, the soil is mapped as McElvee:shallow phase.

The McElvee series, classified as a Rego Gleysol, is poorly drained; some slightly depressional areas on the lower levee slopes are very poorly drained. Nearby level topography, seepage from the streams and slow water percolation through the upper profile are the dominant features responsible for the poor drainage. A representative profile, located in a cultivated field in Matsqui Municipality was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 6 | Light brownish gray to pale-brown (10YR 6/2.5, dry) or very dark grayish brown to dark grayish brown (10YR 3.5/2, moist) loam. Moderate, medium, subangular blocky structure. Few, fine, faint, mottles. Friable when moist. Common roots, pH 5.6.<br>Clear boundary: |
| Cg1 | 6 -13 | Very pale brown (10YR 7/3, dry) or grayish-brown (10YR 5/2, moist) silt loam. Weak, medium, psuedo-subangular blocky structure. Common, medium, faint, dark yellowish brown (10YR 4/4, moist) mottles. Firm when moist. Occasional roots. pH 5.6.<br>Abrupt boundary: |
| IICg1 | 13 -16 | Pale-brown (10YR 6/3, dry) or light brownish gray (10YR 6/2, moist) loamy sand. Single-grained. Common, fine, prominent, dark-red (2.5YR 3/6, moist) mottles. Loose when moist. Occasional roots. pH 5.7.<br>Abrupt boundary: |
| Cg2 | 16 -28 | Light-gray (10YR 7/2, dry) or grayish-brown (10YR 5/2, moist) silt loam. Massive. Many, fine, prominent, dark-red (2.5YR 3/6, moist) mottles. Firm when moist. Occasional roots. pH 5.7.<br>Abrupt boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| IICg2 | 28 -30 | Light-gray (10YR 7/2, dry) to variegated coarse sand. Single-grained. Many, fine distinct, yellowish-red (5YR 4/6, moist) mottles. Loose when moist. pH 5.8.<br>Abrupt boundary: |
| Cg3 | 30 + | Grayish-brown (10YR 5/2, moist) sandy clay loam. Massive. Few, distinct, dark-brown (7.5YR 4/4, moist) mottles. Friable when moist. |

### Land Use

The total acreage of McElvee soils is presently utilized for hay and pasture production. Yields are frequently poor due to sedge and buttercup content, a result of poor drainage which has killed most of the clovers. Tile drainage is very beneficial.

These soils are friable and have a moderate water holding capacity.

## Sardis Series

The Sardis series occupies a very minor acreage on the lowland in the northern part of Langley Municipality and occurs in the immediate area where streams from the upland begin to flow across the lowland. For a more detailed description of the Sardis series refer to page 75 of this report.

## REGOSOL SOILS

These are well to imperfectly drained soils that lack discernible horizons or in which development is limited to a very weakly developed Ah horizon. An organic surface horizon less than 12 inches thick may be present. These soils are usually found on recent geologic deposits. The Orthic, Mull and Gleyed Mull Regosol subgroups were identified on the Fraser River lowland.

### Orthic Regosol Soils

These are well drained soils lacking any horizon development other than a thin or very weak Ah horizon. An organic surface horizon not more than two inches thick may be present. This subgroup is represented by the Grevell series.

## Mull Regosol Soils

These are moderately well to well drained soils with profile development restricted to a distinct Ah horizon. Mull Regosol soils are found on the Fraser River floodplain and are represented by the Monroe and Lickman series.

## Gleyed Mull Regosol Soils

Gleyed Mull Regosol soils have developed under imperfect drainage conditions. Profile development is restricted to a distinct Ah horizon with weak mottling and gleying occurring in the subsoil. Representatives of these soils on the lowlands are the Bates and Fairfield series.

## Orthic Regosol Soils

### Grevell Series

This soil occupies a minor acreage adjacent to the Fraser River in the northern part of Langley Municipality and on Barnston Island between elevations of 10 to 15 feet. The topography is gently sloping and undulating with slopes from two to five percent. Grevell sand-loamy sand occupies 244 acres, Grevell loamy sand-sand occurs on 90 acres. Another 79 acres were mapped as a Grevell-Page-Page:shallow phase soil complex.

The Grevell series occupies the most recent lateral accretion deposits of the Fraser River. Surface textures are usually sand or loamy sand with minor inclusions of sandy loam. The subsoil is composed of sand containing scattered bands of heavier textured sediments. Because of proximity to the alkaline water of the Fraser River, profile reaction varies from neutral at the surface to slightly alkaline at depth.

The Grevell series has been classified as a well to rapidly drained Orthic Regosol and has little or no profile development. The mapping unit includes small, scattered areas having imperfect drainage. During flood stages of the river, a water table exists which rises and falls in accord with the river level. Native vegetation consists of cottonwood, willow, alder, vine maple, thimbleberry, twinberry, dogwood, and a few herbs and weeds. An undisturbed profile examined about 300 feet northwest of the Lefeuvre-River roads junction in Matsqui Municipality was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| L-H | ½- 0 | Undecomposed grass and forest litter. pH 7.0. |

| Horizon | Depth Inches | Description |
|---|---|---|
| C1 | 0 - 9 | Gray (10YR 6/1, dry) or dark-gray to gray (10YR 4.5/1, moist) medium sand. Single-grained. Loose when moist. Common roots. pH 7.2. Abrupt boundary: |
| C2 | 9 -12 | Light brownish gray (10YR 6/2, dry) or grayish-brown (10YR 5/2, moist) loamy fine sand. Weak, fine, psuedo-subangular blocky structure. Loose when moist. Occasional roots. pH 7.3. Abrupt boundary: |
| Cgj | 12 -22 | Gray (10YR 6/1, dry) or brown to yellowish-brown (10YR 5/3.5, moist) medium sand. Single-grained. Loose when moist. Few, fine, faint, mottles. Occasional roots. pH 7.4. Abrupt boundary: |
| C3 | 22 + | Light brownish gray (10YR 6/2, dry) or gray to grayish-brown (10YR 5/1.5, moist) medium sand. Single-grained. Loose when moist. pH 7.4. |

## Land Use

The Grevell series usually occurs in small scattered areas and is managed similarly to the surrounding soils. Because of the coarse textures, the moisture holding and exchange capacities are low, and manuring, fertilizing and irrigation are required for satisfactory crop production. These soils are best suited for pasture. On Barnston Island all the Grevell series occurs outside the dykes and is used for building sites and rough pasture while on McMillan Island the major portion of this soil is not cleared.

## Mull Regosol Soils

### Monroe Series

The Monroe soils occur on Barnston and McMillan islands and near the Fraser River in the northern part of Langley Municipality between 10 and 20 feet elevations. Undulating to rolling with slopes from three to 10 percent is the usual topography. In this ridge- and -swale topography, the Monroe soils occur on the upper slopes and tops of the ridges; the Fairfield soils are on the lower slopes and either Page, Prest or Hjorth soils in the depressions. Fifty-two acres of Monroe silt loam, 55 acres of Monroe silt loam-silty clay loam and an additional 276 acres of several soil complexes in which the Monroe soils predominate were mapped.

These soils are derived from the floodplain deposits of the Fraser River. These deposits, mainly in the form of point bars and meander scrolls, were laid down by lateral accretion. Surface textures, usually silt loam, sometimes vary to loam and silty clay loam. Sands and gravels underlie the finer surface deposits at various depths; where they occur less than 18 inches below the surface, the soil is mapped as Monroe:shallow phase.

These soils are moderately well to well drained. They have little profile development except for organic matter accumulation in the surface and are classified as Mull Regosols. Mottling occurs in the subsoil, generally below 24 inches. Scattered areas still in the native state support cottonwood, maple, alder, birch, and scattered Douglas fir, cedar and hemlock with an understory including blackberry, thimbleberry, salmonberry, nettles, thistles, and grasses. A cultivated profile, located near the eastern end of Barnston Island was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 4 | Grayish-brown (10YR 5/2, dry) or dark-brown to very dark brown (10YR 2.5/2.5, moist) silt loam. Moderate, fine to very fine, subangular blocky structure. Friable when moist. Abundant roots. pH 5.5.<br>Abrupt boundary: |
| C1 | 4 -15 | Pale-brown (10YR 6/3, dry) or dark grayish brown (10YR 4/2, moist) silt loam or silty clay loam. Moderate, fine to medium, psuedo-subangular blocky structure; somewhat vesicular. Firm when moist. Abundant roots to 12 inches, common thereafter. pH 5.8.<br>Clear boundary: |
| C2 | 15 -24 | Pale-brown (10YR 6/3, dry) or brown to dark-brown (10YR 4.5/3, moist) silt loam or silty clay loam. Weak, medium, psuedo-subangular blocky structure. Firm when moist. Occasional roots. pH 5.8.<br>Clear boundary: |
| Cgj1 | 24 -30 | Pale-brown (10YR 6/3, dry) or yellowish-brown (10YR 5/4, moist) very fine sandy loam. Weak, medium, psuedo-subangular blocky structure. Few, fine, faint mottles. Very friable when moist. Occasional roots. pH 6.0.<br>Clear boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Cgj2 | 30 -38 | Pale-brown (10YR 6/3, dry) or brown to dark-brown (10YR 4/3, moist) silt loam. Moderate, medium to coarse, psuedo-subangular blocky structure. Common, fine, distinct, yellowish-red (5YR 4/6, moist) mottles. Firm when moist. Occasional roots. pH 6.1.<br>Gradual boundary: |
| Cgj3 | 38 + | Pale-brown (10YR 6/3, dry) or brown to dark-brown (10YR 4/3, moist) silt loam. Massive. Common, fine, distinct, yellowish-red (5YR 5/6, moist) mottles. Firm when moist. pH 6.0. |

### Land Use

The Monroe soils are among the best to be found in the mapped area and most of the acreage is used for the production of hay and pasture. However, since the relief is undulating to rolling they are not well suited for peas and other crops requiring uniform maturity. They are well adapted for small fruit production.

If levelling is contemplated, care should be taken to avoid exposing the underlying sands by scraping aside the surface soil, levelling the subsoil and returning the surface soil to its original position.

These soils are friable, have good rooting depth and are relatively easy to cultivate. Water holding capacity is moderate and irrigation, especially on the shallow phase, is required for good crop production.

## Lickman Series

The Lickman soils occupy a very minor acreage in the northern part of Langley Municipality at elevations between 15 to 30 feet. The topography is gently undulating with slopes from two to six percent. Associated soils are the Sardis Complex and the Bates series. Seventy-seven acres were mapped as three soil complexes in which the Lickman series occupies the major part.

The parent material of this soil consists of alluvium deposited by streams which originate on the upland and flow across the Fraser River lowland. During flood stage, these streams overflow their banks and deposit sediments eroded from the upland. Surface textures of silt loam or loam overlie sands or gravelly sands. If the coarse substratum occurs at depths of less than 18 inches, the area is mapped as Lickman: shallow phase. Sand lenses may occur in the finer textured overlay.

These soils are well to moderately well drained Mull Regosols. Weak gleying and mottling may occur in the lower part of the profile. Permeability and root penetration is good. Natural vegetation consists of cottonwood, alder, vine maple, blackberry, nettles, and others. A cultivated profile, examined about 600 feet west of the McLennan Creek and Bates Road junction in Matsqui Municipality, was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 7 | Brown to pale-brown (10YR 5.5/3, dry) or dark grayish brown (10YR 4/2, moist) silt loam. Moderate, fine, subangular blocky breaking to medium, granular structure. Friable when moist. Common roots. pH 6.3.<br>Clear boundary: |
| IIC | 7 -17 | Light yellowish brown (10YR 6/4, dry) or brown to pale-brown (10YR 5.5/3, moist) loamy fine sand. Weak, fine, psuedo-subangular blocky structure. Very friable when moist. Common roots. pH 6.1.<br>Abrupt boundary: |
| C | 17 -22 | Pale-brown (10YR 6/3, dry) or brown (10YR 5/3, moist) fine sandy loam. Weak, fine, psuedo-subangular blocky structure. Very friable when moist. Occasional roots. pH 5.7.<br>Abrupt boundary: |
| Cgj | 22 -28 | Light-gray (10YR 7/2, dry) or brown (10YR 5/3, moist) loam. Weak, medium, psuedo-subangular blocky structure. Common, fine, faint, yellowish-brown (10YR 5/6, moist) mottles. Friable when moist. Occasional roots. pH 5.7.<br>Gradual boundary: |
| Cg | 28 + | Light-gray (10YR 7/2, dry) or grayish-brown (10YR 5/2, moist) sandy loam. Massive. Common, fine, distinct yellowish-brown (10YR 5/6-5/8, moist) mottles. Friable when moist. pH 5.8. |

## Land Use

These soils are presently used for hay and pasture production. However, they are sufficiently well drained to produce a wide variety of crops. Rooting depth is good and fertility is satisfactory. Irrigation is beneficial in the dry season, especially in the shallow phase, because of low water holding capacity. Small fruits are suitable for growing on these soils if irrigated.

## Gleyed Mull Regosol Soils

### Fairfield Series

The Fairfield soils occur on the Fraser River floodplain in the northern part of Langley Municipality and on Barnston and McMillan islands. The topography is gently to moderately undulating with two to six percent slopes. The Fairfield soils are found mainly on the slopes between the well drained Monroe and the poorly drained Page and Hjorth series. Elevations range from 10 to 20 feet above sea level. The Fairfield series occurs on 30 acres in the map area while an additional 831 acres are mapped as several soil complexes in which the Fairfield series predominates.

The parent material, similar to that of the Monroe series, consists of Fraser River floodplain material deposited by lateral accretion. Surface textures range from silt loam to silty clay loam and grade into medium to coarse sand at depth, usually deeper than 24 inches. Areas in which the sand is encountered at depths less than 18 inches are mapped as Fairfield:shallow phase. Thin sand lenses may occur in the finer textured overlay.

The Fairfield series is imperfectly drained and classed as a Gleyed Mull Regosol. A fluctuating water table occurs in the winter and spring. At high water on the Fraser River, the water table rises through the sand strata beneath the soil profile. Permeability is moderate and during periods of heavy rainfall internal drainage is insufficient to cope with the precipitation causing saturation for short periods. These soils have good rooting depth and are medium acid at the surface and slightly acid or neutral at depth.

Native vegetation consisted mainly of cottonwood, alder, vine maple, willow, blackberry, salmonberry, nettles, and various grasses. Almost all the Fairfield soil areas have been cleared and are presently cultivated. A cultivated profile located near the western tip of Barnston Island was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 7 | Grayish-brown (10YR 5/2, dry) or dark-brown to brown (10YR 3.5/3, moist) silt loam. Weak to moderate, fine, subangular blocky structure. Friable when moist. Abundant roots. pH 5.2. Abrupt boundary: |
| Cgj1 | 7 -11 | Yellowish-brown (10YR 5/4, moist) silt loam. Weak, medium, psuedo-subangular blocky structure. Few, fine, faint, mottles. Firm when moist. Common roots. pH 5.7. Clear boundary: |

| Horizon | Depth Inches | Description |
|---|---|---|
| Cgj2 | 11 -18 | Yellowish-brown (10YR 5/4, moist) silt loam. Weak, medium, psuedo-subangular blocky structure. Common, medium, faint, dark yellowish brown (10YR 3/4, moist) mottles. Firm when moist. Common roots. pH 5.7.<br>Clear boundary: |
| Cg1 | 18 -30 | Dark grayish brown (10YR 4/2, moist) silt loam. Weak, medium, psuedo-subangular blocky structure. Many, coarse, distinct, dark reddish brown (5YR 3/3.5, moist) mottles. Firm when moist. Occasional roots in upper part. pH 5.7.<br>Clear boundary: |
| IICg | 30 -40 | Dark grayish brown to grayish-brown (2.5Y 4.5/2, moist) loamy fine sand or fine sandy loam. Weak, coarse, psuedo-subangular blocky breaking to single-grained. Many, coarse, distinct, dark-brown (7.5YR 3/2, moist) mottles. Friable when moist. pH 5.9.<br>Clear boundary: |
| Cg2 | 40 + | Grayish-brown to light grayish brown (2.5Y 5.5/2, moist) silt loam. Massive. Many, fine to medium, distinct, dark-brown (7.5YR 3/2, moist) mottles. Firm when moist. pH 5.7. |

### Land Use

The Fairfield soils are used for the production of hay, pasture and silage corn. The undulating topography and close association with other soils of different moisture relationships causes the Fairfield soils to be generally unsuitable for crops requiring uniform maturity. However, where areas of Fairfield soils occur in acreages permitting separate management, good production of a wide range of crops is possible.

Tile drainage is not required for these imperfectly drained soils. Poor drainage conditions exist for only short periods of time and do not greatly restrict crop growth. Fertility of the Fairfield soils is generally good and cultivation is easy. During the summer these soils respond to irrigation although their drought resistance is high.

## Bates Series

The Bates series occurs only in Glen Valley between elevations of 15 and 20 feet. Gently undulating to undulating topography is general, with slopes to nine percent. Two soil complexes, totalling 107 acres, in which the Bates soil occupies the major part were mapped.

This series is derived from local stream deposits similar to those which form the parent material of the Lickman series. Materials eroded from the uplands, mainly glacio-marine sediments, were redeposited as natural levees along present and abandoned stream courses. These levees, which exceed two feet in thickness, overlie Fraser floodplain deposits. Surface profile textures vary from silt loam to silty clay loam.

This imperfectly drained soil is classified as a Gleyed Mull Regosol. The natural vegetation, surviving in a few scattered areas, consists of cedar, cottonwood, alder, willow, vine maple, blackberry, thimbleberry, and others. A representative profile, located in a cultivated field in Matsqui Municipality, was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Ap | 0 - 7 | Dark-gray (10YR 4/1, dry) or very dark brown (10YR 2/2, moist) silt loam. Moderate, fine, subangular blocky breaking to medium, granular structure. Friable when moist. Abundant roots. pH 5.1.<br>Abrupt boundary: |
| Cgj | 7 -14 | Pale-brown (10YR 6/3, dry) or gray-brown (2.5Y 5/2, moist) silt loam. Moderate, coarse, psuedo-subangular blocky structure. Few, fine, faint, mottles. Friable when moist. Common roots. pH 5.3.<br>Clear boundary: |
| Cg1 | 14 -26 | Light brownish gray (10YR 6/2, dry) or light olive gray to olive-gray (5Y 5.5/2, moist) silty clay loam. Weak, coarse, psuedo-subangular blocky structure. Common, medium, distinct, yellowish-brown (10YR 5/6, moist) mottles. Firm when moist. Occasional roots. pH 5.4.<br>Gradual boundary: |
| Cg2 | 26 + | Light-gray (10YR 7/2, dry) or light olive gray to olive-gray (5Y 5.5/2, moist) silty clay loam. Weak, coarse, psuedo-subangular blocky structure. Many, medium, prominent, strong-brown (7.5YR 5/6, moist) mottles. Firm when moist. pH 5.5. |

## Land Use

The Bates soils are used chiefly for hay and pasture production. They occur as irregular and small areas which necessitates they be managed similarity to the surrounding series. Forage yields are high.

Tile drainage is not required for forage production although some crops which are very sensitive to "wet feet" may suffer some damage during the winter and spring months. Water holding capacity is good and during most years only infrequent irrigations are required for satisfactory production.

# ORGANIC SOILS

For a generalized description of Organic soils refer to page 76 of this report.

Both Peat and Muck soils were differentiated on the lowlands of this map-area.

## Muck Soils

For a generalized description of Muck soils refer to page 76 of this report.

Banford muck, a Shallow Muck, and Gibson muck, a Deep Muck, were differentiated on the lowlands of Langley Municipality and Barnston Island.

## Peat Soils

These are very poorly drained organic soils, usually greater than three feet deep. Surface horizons consist of raw or slightly decomposed peat while subsurface strata may be at various stages of decomposition. A mat of living sphagnum moss is common in the surface. These soils are generally very strongly acid.

The Peat soils are represented on the lowlands by Triggs peat.

## Muck Soils

### Banford Muck

Banford muck occurs in scattered areas on the Fraser River flood-plain in the northern part of Langley Municipality. The topography varies from level to gently undulating and is slightly depressional in relation to the mineral soils. Elevations are from eight to 15 feet. Usually the Banford muck is associated with the Annis series and/or Gibson muck, with no topographic or other distinguishing surface features. Separations are based on differences in the depth of the organic deposit. A total of 156 acres was mapped as two soil complexes in which Banford muck occupies the major proportion.

The Banford muck has developed on organic deposits which are 12 to 24 inches deep. Those that are deeper are designated as Gibson muck. The surface layer has decomposed to muck; underlying layers vary from semi-decomposed peat to muck. The underlying Fraser River floodplain material ranges from silt loam to silty clay loam and is strongly gleyed.

The Banford muck is very poorly drained and is classed as Shallow Muck. Native vegetation is swamp forest, containing, among others, cottonwood, cedar, hardhack, and skunk cabbage. A cultivated profile about one-quarter mile north and 100 yards west of the Gray-Lefeuvre roads junction in Matsqui Municipality was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Hp<br>Oh | 23 -16<br>0 - 7 | Very dark gray to dark-gray (10YR 3.5/1, dry) or black (10YR 2/1, moist) muck. Very friable when moist. Common roots. pH 4.3.<br>Clear boundary: |
| FH<br>[illegible] | 16 -11<br>7 - 12 | Very dark grayish brown to dark-brown (10YR 3/2.5, dry) peaty muck. Friable when moist. Common roots. pH 4.2.<br>Gradual boundary: |
| H<br>Oh | 11 - 0<br>12 - 23 | Light-gray and dark grayish brown (10YR 7/1 and 10YR 4/2, dry) or dark grayish brown to brown (10YR 4/2.5, moist) muck with high content of silt. Weak, medium, psuedo-subangular blocky structure. Few, fine, faint, mottles. Firm when moist. Abundant roots. pH 4.7.<br>Abrupt boundary: |
| Cg1 | 0 -14 | Light-gray (10YR 7/1, dry) or grayish-brown (10YR 5/2, moist) silty clay loam. Massive. Few, fine, faint, dark yellowish brown (10YR 4/4, moist) mottles. Firm when moist. Common roots. pH 4.7.<br>Clear boundary: |
| Cg2 | 14 + | Light-gray (10YR 6.5/1, dry) or gray (5Y 5/1, moist) silt loam. Massive. Few, medium, promi- |

T.H
- humic
- humid
subhumid
- typic
- medium

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| Horizon | Depth Inches | Description |
|---|---|---|
| | | nent, yellowish-brown (10YR 5/6, moist) mottles. Firm when moist. pH 4.6. |

**Land Use**

This soil is similar in use to Gibson muck. Refer to Land Use section under Gibson muck on page 110.

## Gibson Muck

This soil occupies large areas on the Fraser River floodplain in the northern part of Langley Municipality and on Barnston Island. The topography varies from slightly depressional to level and very gently undulating; elevations are from eight to 15 feet. Commonly Gibson muck is associated with Triggs peat and Banford muck. A total of 840 acres of Gibson muck are mapped in addition to 505 acres of three soil complexes in which this soil predominates.

The Gibson muck has developed under the influence of a water table which is at or near the surface for most of the year. Seepage from surrounding uplands and the Fraser River are the chief causes for the high water table conditions. The wet environment favours the accumulation of organic material while inhibiting decomposition. The organic deposits, derived mainly from reeds and sedge, are two or more feet deep and are underlain by fine textured Fraser River sediments. Scattered bands of mineral material occur in many profiles. In cleared areas, the cultivated surface has decomposed to muck; uncleared areas sometimes have semi-decomposed surfaces. Underlying organic material is at various stages of decomposition. Reactions are slightly to strongly acid.

Gibson soils are very poorly drained and classed as Deep Muck. Native vegetation is swamp forest consisting of cedar, hemlock, birch, alder, willow, hardhack, sweet gale, blackberry, skunk cabbage, and others. A cultivated profile located near the center of Barnston Island was described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| Hp | 0 - 5 | Dark grayish brown (10YR 4/2, dry) or very dark brown (10YR 2/2, moist) muck. Weak, fine, granular structure. Friable when moist. Abundant roots. pH 4.0. Abrupt boundary: |

Fn. F

| Horizon | Depth Inches | Description |
|---|---|---|
| FH1 | 5 -11 | Dark reddish brown (5YR 3/3, moist) peaty muck. Weakly stratified. Friable when moist, hard when dry. Common roots. pH 4.1.<br>Clear boundary: |
| FH2 | 11 -16 | Dark reddish brown (5YR 2/2, moist) peaty muck. Partly to well decomposed. Firm when moist, hard when dry. Common roots in upper part, occasional in lower part. pH 4.6.<br>Clear boundary: |
| F1 | 16 -26 | Dark brown (7.5YR 3/2, moist) mucky peat. Partly decomposed. Very firm when moist, hard when dry. Occasional roots. pH 4.8.<br>Gradual boundary: |
| F2 | 26 -38 | Dark-brown (7.5YR 3/2, moist) peat. Partly decomposed reeds and sedge. Scattered one inch bands of gray (5Y 5/1, moist) silty clay loam. Very firm when moist. pH 5.0.<br>Diffuse boundary: |
| L | 38 + | Fibrous peat of variegated colour. Mainly undecomposed reeds and sedge. pH 4.8. |

## Land Use

Those areas of Gibson muck which have been reclaimed are presently used for hay and pasture production. Sedge content of the forage is high and feed value low. Drainage is required to improve forage quality and yields. If properly managed these soils are highly productive, especially for such specialized crops as blueberries and vegetables.

Seepage from higher areas can often be reduced by installation of intercepting tile lines and ditches. Tile lines or open ditches are satisfactory for drainage within the bog; however, the water table should not be lowered more than is required for good crop growth. Over draining causes excessive subsidence of the organic deposits and often results in droughty conditions during the latter part of the growing season. A water control system which permits progressive lowering of the water table as the growing season progresses is the most satisfactory.

## Peat Soils

### Triggs Peat

This soil type occupies small areas of Glen Valley and a substantial part of the lowlands in northeastern Langley Municipality. The topography is slightly depressional to very gently sloping and elevations are between eight and 12 feet. Eight hundred and sixteen acres are classed as Triggs peat with an additional 53 acres designated as Triggs-Gibson complex.

Sphagnum peat constitutes the parent material, which in the mapped area always exceeds 36 inches in depth. Beneath the surface layer of living moss the organic residues are well preserved and individual plant remains are easily recognizable. The organic deposit, resting on fine textured Fraser River sediments, has a permanent water table at or near the surface and is extremely acid in reaction.

The sphagnum moss and bog water are low in carbonates and other bases and high acidity is produced by decomposition of the organic matter. The acidity of the bog water may become severe enough to sterilize the peat so that decomposition stops. However, sphagnum continues to grow and accumulate on the surface.

Under natural conditions there is a scattered tree cover of shore pine, alder, bog birch, and hemlock. A thick shrub cover of Labrador tea, hardhack, sweet gale, and wild cranberry occurs. An undisturbed profile about 200 feet west of the Lefeuvre-Mathers roads intersection in Matsqui Municipality was examined and described as follows:

| Horizon | Depth Inches | Description |
|---|---|---|
| 1 | 0 - 5 | Living sphagnum moss and litter of Labrador tea and hardhack leaves. Abundant fibrous roots. pH 4.2.<br>Clear boundary: |
| 2 | 5 - 9 | Brown (7.5YR 5/4, moist) slightly decomposed sphagnum moss. Abundant fibrous roots. pH 3.7.<br>Abrupt boundary: |
| 3 | 9 -14 | Dark reddish brown to dark-red (2.5YR 3/5, moist) partly decomposed sphagnum moss. Abundant roots. pH 3.4.<br>Clear boundary: |
| 4 | 14 -30 | Very dusky red to dark reddish brown (2.5YR 2/3, moist) partly decomposed sphagnum moss. |

| Horizon | Depth Inches | Description |
|---|---|---|
| | | Slightly fibrous. Abundant tree roots. pH 3.6. Gradual boundary: |
| 5 | 30 + | Dusky-red to dark reddish brown (2.5YR 3/3, moist) slightly decomposed sphagnum moss. Abundant tree roots. pH 4.4. |

## Land Use

The entire acreage of Triggs peat is presently in the native state. If reclaimed, these soils can produce good yields of blueberries, cranberries and some vegetables. First however, the extremely high water table and acidity has to be controlled.

A suggested method of reclamation is as follows:

a) Burning of peat or of logs and brush on peat should not be practised. Shrubs and small trees may be plowed in.
b) After breaking it is not advisable to cultivate for two or three years in order to give turned-in plants time to decompose. Although liming at this stage may not be economical, it helps accelerate decomposition.
c) The use of a heavy roller is desirable to compact the peat and improve the capillary rise of moisture.
d) During subsequent years adequate liming and fertilization will improve soil productivity. Rapid subsidence of the peat is not desirable and can be reduced by water table control. The water table should be maintained at a depth slightly below the rooting zone of the crops grown.

Since severe restrictions on productivity are imposed by very poor drainage, extreme acidity and low content of available plant nutrients, only moderate crop yields should be expected for some years after reclamation.

Where tree root content is not excessive, the peat is suitable for commercial harvesting.

## MISCELLANEOUS LAND TYPES

### Dykes

Approximately 108 acres are occupied by dykes in Langley Municipality and on Barnston Island.

## Gravel Pits

Numerous gravel pits, totalling about 341 acres, occur throughout Langley Municipality. They are operated either by private firms, the municipality or the British Columbia Department of Highways.

## Trans-Canada Highway

The Trans-Canada Highway, designated as Highway "401", traverses Langley Municipality and occupies approximately 502 acres.

## Ponds

Scattered ponds, both natural and aritifical, occupy about 46 acres in the map area.

## Urban Areas

Langley City, Fort Langley, Milner, Murrayville, and Aldergrove as well as some smaller subdivided areas collectively encompass approximately 1,099 acres.

Table 2 - Map Symbols and Acreages of the Different Soils and Miscellaneous Areas.

| Soils | Map Symbol | Acreage | Total |
|---|---|---|---|
| Abbotsford silt loam | ADsil | 50 | |
| Abbotsford silt loam-loam | ADsil-l | 144 | |
| Abbotsford-Columbia soil complex | AD-CL | 749 | 943 |
| Aldergrove series | AE | 18 | |
| Aldergrove loamy sand-sandy loam | AEls-sl | 43 | |
| Aldergrove gravelly sandy loam | AEgsl | 44 | |
| Aldergrove sandy loam | AEsl | 136 | |
| Aldergrove sandy loam-loam | AEsl-l | 100 | |
| Aldergrove gravelly loam | AEgl | 22 | |
| Aldergrove loam | AEl | 84 | |
| Aldergrove silt loam-loam | AEsil-l | 75 | |
| Aldergrove-Columbia soil complex | AE-CL | 105 | |
| Aldergrove-Jackman soil complex | AE-JM | 541 | |
| Aldergrove-Judson soil complex | AE-JN | 31 | |
| Aldergrove-Milner soil complex | AE-MR | 30 | |
| Aldergrove-Scat soil complex | AE-SC | 87 | |
| Aldergrove-Whatcom soil complex | AE-W | 554 | |
| Aldergrove-Whatcom:shallow phase soil complex | AE-W:sp | 26 | |

Table 2 - continued

| Soils | Map Symbol | Acreage | Total |
|---|---|---|---|
| Aldergrove-Scat-Whatcom:shallow phase soil complex | AE-SC-W:sp | 126 | |
| Aldergrove-Whatcom-Jackman soil complex | AE-W-JM | 72 | |
| Aldergrove-Whatcom-Scat soil complex | AE-W-SC | 135 | |
| Aldergrove-Whatcom:shallow phase-Whatcom soil complex | AE-W:sp-W | 77 | 2,306 |
| Annis series | AN | 54 | |
| Annis-Banford soil complex | AN-BD | 41 | |
| Annis-Hjorth soil complex | AN-HJ | 51 | |
| Annis-Hazelwood soil complex | AN-HD | 18 | 164 |
| Banford-Annis soil complex | BD-AN | 42 | |
| Banford-Hallert soil complex | BD-HT | 114 | 156 |
| Bates-Lickman soil complex | BT-LK | 88 | |
| Bates-McElvee soil complex | BT-ME | 19 | 107 |
| Berry series | BR | 54 | |
| Berry silt loam | BRsil | 356 | |
| Berry clay loam | BRcl | 14 | |
| Berry-Cloverdale soil complex | BR-CD | 1,520 | |
| Berry-Carvolth soil complex | BR-CV | 157 | |
| Berry-Murrayville-Cloverdale soil complex | BR-MY-CD | 154 | 2,255 |
| Boosey loam | BYl | 10 | 10 |
| Bose series | BO | 49 | |
| Bose gravelly sandy loam | BOgsl | 167 | |
| Bose-Boosey soil complex | BO-BY | 59 | |
| Bose-Nicholson soil complex | BO-N | 131 | |
| Bose-Scat soil complex | BO-SC | 61 | |
| Bose-Nicholson-Scat soil complex | BO-N-SC | 616 | |
| Bose-Scat-Nicholson soil complex | BO-SC-N | 180 | 1,263 |
| Carvolth series | CV | 172 | |
| Carvolth loam-silt loam | CVl-sil | 52 | |
| Carvolth silt loam-silty clay loam | CVsil-sicl | 191 | |
| Carvolth silty clay loam | CVsicl | 118 | |
| Carvolth-Berry soil complex | CV-BR | 10 | |
| Carvolth-Berry-Westlang soil complex | CV-BR-WL | 110 | 653 |
| Cloverdale silty clay loam | CDsicl | 27 | |
| Cloverdale clay loam | CDcl | 403 | |
| Cloverdale clay loam-clay | CDcl-c | 1,038 | |
| Cloverdale-Berry soil complex | CD-BR | 254 | |
| Cloverdale-Carvolth soil complex | CD-CV | 68 | |
| Cloverdale-Heron soil complex | CD-HN | 13 | |
| Cloverdale-Milner soil complex | CD-MR | 115 | |
| Cloverdale-Scat soil complex | CD-SC | 13 | |

Table 2 - continued

| Soils | Map Symbol | Acreage | Total |
|---|---|---|---|
| Cloverdale-Livingstone-Berry soil complex | CD-LV-BR | 155 | 2,086 |
| Columbia series | CL | 268 | |
| Columbia loamy sand | CLls | 102 | |
| Columbia sandy loam | CLsl | 562 | |
| Columbia gravelly loam | CLgl | 591 | |
| Columbia loam | CLl | 101 | |
| Columbia sandy loam-loamy sand | CLsl-ls | 220 | |
| Columbia sandy loam-gravelly sandy loam | CLsl-gsl | 221 | |
| Columbia sandy loam-loam | CLsl-l | 376 | |
| Columbia gravelly loam-sandy loam | CLgl-sl | 336 | |
| Columbia loam-gravelly loam | CLl-gl | 349 | |
| Columbia-Abbotsford soil complex | CL-AD | 1,373 | |
| Columbia-Aldergrove soil complex | CL-AE | 1,170 | |
| Columbia-Defehr soil complex | CL-DR | 105 | |
| Columbia-Lehman soil complex | CL-LH | 776 | |
| Columbia-Lynden soil complex | CL-LY | 547 | |
| Columbia-Peardonville soil complex | CL-PD | 41 | |
| Columbia-Whatcom soil complex | CL-W | 63 | |
| Columbia-Whatcom:shallow phase soil complex | CL-W:sp | 651 | |
| Columbia-Aldergrove-Jackman soil complex | CL-AE-JM | 535 | |
| Columbia-Aldergrove-Whatcom soil complex | CL-AE-W | 65 | |
| Columbia-Defehr-Lehman soil complex | CL-DR-JM | 159 | |
| Columbia-Lehman-Ross soil complex | CL-LH-RS | 123 | 8,734 |
| Cornock silt loam-loam | CRsil-l | 61 | |
| Cornock-Hallert soil complex | CR-HT | 9 | 70 |
| Custer sandy loam | Csl | 72 | 72 |
| Defehr series | DR | 12 | |
| Defehr-Lehman soil complex | DR-LH | 65 | |
| Defehr-Lehman-Columbia soil complex | DR-LH-CL | 28 | 105 |
| Fairfield series | F | 30 | |
| Fairfield-Fairfield:shallow phase soil complex | F-F:sp | 224 | |
| Fairfield-Hjorth soil complex | F-HJ | 121 | |
| Fairfield-Monroe soil complex | F-M | 116 | |
| Fairfield-Monroe:shallow phase soil complex | F-M:sp | 13 | |
| Fairfield-Page soil complex | F-PE | 78 | |
| Fairfield-Monroe-Page soil complex | F-M-PE | 216 | |
| Fairfield:shallow phase-Hjorth-Fairfield soil complex | F:sp-HJ-F | 58 | |

Table 2 - continued

| Soils | Map Symbol | Acreage | Total |
|---|---|---|---|
| Fairfield:shallow phase-Monroe:shallow phase-Page soil complex | F:sp-M:sp-PE | 5 | 861 |
| Gibson muck | GN | 840 | |
| Gibson-Banford soil complex | GN-BD | 315 | |
| Gibson-Niven soil complex | GN-NN | 39 | |
| Gibson-Triggs soil complex | GN-TR | 151 | 1,345 |
| Grevell sand-loamy sand | Gs-ls | 244 | |
| Grevell loamy sand-sand | Gls-s | 90 | |
| Grevell-Page-Page:shallow phase soil complex | G-PE-PE:sp | 79 | 413 |
| Hallert series | HT | 220 | |
| Hallert-Hazelwood soil complex | HT-HD | 28 | |
| Hallert-Niven soil complex | HT-NN | 69 | 317 |
| Hazelwood silty clay loam | HDsicl | 37 | |
| Hazelwood-Annis soil complex | HD-AN | 40 | |
| Hazelwood-Cornock soil complex | HD-CR | 18 | |
| Hazelwood-Hallert soil complex | HD-HT | 21 | |
| Hazelwood-Sim soil complex | HD-SI | 26 | 142 |
| Heron series | HN | 28 | |
| Heron-Scat soil complex | HN-SC | 26 | |
| Heron-Sunshine soil complex | HN-SS | 117 | 171 |
| Hjorth silt loam | HJsil | 74 | |
| Hjorth silty clay loam | HJsicl | 127 | |
| Hjorth-Fairfield soil complex | HJ-F | 60 | |
| Hjorth-Page soil complex | HJ-PE | 14 | 275 |
| Jackman series | JM | 66 | |
| Jackman loam | JMl | 65 | |
| Jackman silt loam | JMsil | 266 | |
| Jackman silt loam-silty clay loam | JMsil-sicl | 134 | |
| Jackman-Aldergrove soil complex | JM-AE | 487 | |
| Jackman-Judson:shallow phase soil complex | JM-JN:sp | 31 | |
| Jackman-Scat soil complex | JM-SC | 263 | |
| Jackman-Scat-Aldergrove soil complex | JM-SC-AE | 23 | 1,335 |
| Judson muck | JN | 847 | |
| Judson:shallow phase muck | JN:sp | 20 | |
| Judson-Carvolth soil complex | JN-CV | 18 | |
| Judson-Judson:shallow phase soil complex | JN-JN:sp | 725 | |
| Judson:shallow phase-Judson soil complex | JN:sp-JN | 55 | |
| Judson:shallow phase-Heron soil complex | JN:sp-HN | 119 | |

Table 2 - continued

| Soils | Map Symbol | Acreage | Total |
|---|---|---|---|
| Judson-Lehman soil complex | JN-LH | 61 | |
| Judson:shallow phase-Ross soil complex | JN:sp-RS | 15 | |
| Judson-Judson:shallow phase-Scat soil complex | JN-JN:sp-SC | 137 | |
| Judson-Scat-Whatcom:shallow phase soil complex | JN-SC-W:sp | 60 | 2,057 |
| Katzie silty clay loam | KZsicl | 53 | |
| Katzie silty clay loam-silt loam | KZsicl-sil | 174 | |
| Katzie-Nivel soil complex | KZ-NN | 44 | 271 |
| Langley silt loam-clay loam | LAsil-cl | 764 | 764 |
| Lehman series | LH | 76 | |
| Lehman sandy loam-loamy sand | LHsl-ls | 143 | |
| Lehman loam-gravelly loam | LHl-gl | 30 | |
| Lehman loam | LHl | 59 | |
| Lehman-Custer soil complex | LH-C | 396 | |
| Lehman-Columbia soil complex | LH-CL | 74 | |
| Lehman-Defehr soil complex | LH-DR | 158 | |
| Lehman-Judson soil complex | LH-JN | 80 | |
| Lehman-Judson:shallow phase soil complex | LH-JN:sp | 55 | |
| Lehman-Ross soil complex | LH-RS | 105 | |
| Lehman-Scat soil complex | LH-SC | 28 | |
| Lehman-Defehr-Columbia soil complex | LH-DR-CL | 74 | |
| Lehman-Defehr-Judson:shallow phase soil complex | LH-DR-JN:sp | 128 | 1,406 |
| Lickman-Bates soil complex | LK-BT | 11 | |
| Lickman-Lickman:shallow phase soil complex | LK-LK:sp | 28 | |
| Lickman:shallow phase-Sardis soil complex | LK:sp-SD | 38 | 77 |
| Livingstone series | LV | 12 | |
| Livingstone loam | LVl | 38 | |
| Livingstone silt loam-loam | LVsil-l | 194 | |
| Livingstone-Murrayville soil complex | LV-MY | 823 | |
| Livingstone-Summer soil complex | LV-SR | 91 | |
| Livingstone-Murrayville-Cloverdale soil complex | LV-MY-CD | 151 | 1,309 |
| Lynden gravelly loam sand | LYgls | 315 | |
| Lynden loamy sand | LYls | 1,249 | |
| Lynden gravelly sandy loam | LYgsl | 96 | |
| Lynden gravelly sandy loam-loamy sand | LYgsl-ls | 1,957 | |
| Lynden-Columbia soil complex | LY-CL | 43 | |
| Lynden-Cornock soil complex | LY-CR | 28 | |
| Lynden-Judson-Lehman soil complex | LY-JN-LH | 29 | |

Table 2 - continued

| Soils | Map Symbol | Acreage | Total |
|---|---|---|---|
| Lynden-Lehman-Custer soil complex | LY-LH-C | 156 | 3,873 |
| Marble Hill loam-silt loam | MHl-sil | 238 | |
| Marble Hill silt loam | MHsil | 300 | |
| Marble Hill-Abbotsford soil complex | MH-AD | 55 | |
| Marble Hill-Aldergrove soil complex | MH-AE | 313 | |
| Marble Hill-Columbia soil complex | MH-CL | 211 | |
| Marble Hill-Lehman soil complex | MH-LH | 33 | |
| Marble Hill-Sunshine soil complex | MH-SS | 43 | 1,193 |
| McElvee series | ME | 19 | |
| McElvee-Bates soil complex | ME-BT | 88 | |
| McElvee-Hallert soil complex | ME-HT | 10 | |
| McElvee-McElvee:shallow phase soil complex | ME-ME:sp | 67 | |
| McElvee:shallow phase-Bates:shallow phase soil complex | ME:sp-BT:sp | 11 | 195 |
| Milner series | MR | 111 | |
| Milner-Aldergrove soil complex | MR-AE | 20 | |
| Milner-Berry soil complex | MR-BR | 461 | |
| Milner-Cloverdale soil complex | MR-CD | 2,366 | |
| Milner-Berry-Cloverdale soil complex | MR-BR-CD | 469 | |
| Milner-Nicholson-Scat soil complex | MR-N-SC | 51 | 3,478 |
| Monroe silt loam | Msil | 52 | |
| Monroe silt loam-silty clay loam | Msil-sicl | 55 | |
| Monroe-Fairfield soil complex | M-F | 98 | |
| Monroe-Hjorth soil complex | M-HJ | 2 | |
| Monroe:shallow phase-Monroe soil complex | M-M:sp | 22 | |
| Monroe-Fairfield-Monroe:shallow phase soil complex | M-F-M:sp | 29 | |
| Monroe-Monroe:shallow phase-Fairfield soil complex | M-M:sp-F | 125 | 383 |
| Murrayville loam | MYl | 35 | |
| Murrayville silt loam | MYsil | 48 | |
| Murrayville-Berry soil complex | MY-BR | 63 | |
| Murrayville-Milner soil complex | MY-MR | 30 | |
| Murrayville-Livingstone soil complex | MY-LV | 60 | |
| Murrayville-Berry-Livingstone soil complex | MY-BR-LV | 58 | 294 |
| Nicholson-Aldergrove soil complex | N-AE | 21 | |
| Nicholson-Bose soil complex | N-BO | 213 | |
| Nicholson-Scat soil complex | N-SC | 1,828 | |
| Nicholson-Sunshine soil complex | N-SS | 43 | |
| Nicholson-Whatcom soil complex | N-W | 163 | |
| Nicholson-Whatcom:shallow phase soil complex | N-W:sp | 86 | |

Table 2 - continued

| Soils | Map Symbol | Acreage | Total |
|---|---|---|---|
| Nicholson-Aldergrove-Scat soil complex | N-AE-SC | 15 | |
| Nicholson-Bose-Scat soil complex | N-BO-SC | 138 | |
| Nicholson-Scat-Whatcom soil complex | N-SC-W | 465 | |
| Nicholson-Whatcom-Scat soil complex | N-W-SC | 944 | |
| Nicholson-Whatcom-Whatcom:shallow phase soil complex | N-W-W:sp | 189 | |
| Nicholson-Whatcom:shallow phase-Scat soil complex | N-W:sp-SC | 181 | |
| Nicholson-Whatcom:shallow phase-Whatcom:anthropic phase soil complex | N-W:sp-W:an | 27 | |
| Nicholson-Whatcom:anthropic phase-Scat soil complex | N-W:an-SC | 334 | 4,647 |
| Niven silty clay loam | NNsicl | 68 | |
| Niven-Annis soil complex | NN-AN | 53 | |
| Niven-Hallert soil complex | NN-HT | 128 | 249 |
| Page series | PE | 21 | |
| Page silt loam | PEsil | 103 | |
| Page:shallow phase silt loam-silty clay loam | PE:sp sil-sicl | 30 | |
| Page-Fairfield soil complex | PE-F | 81 | |
| Page-Hjorth soil complex | PE-HJ | 46 | |
| Page-Prest soil complex | PE-PR | 22 | |
| Page-Fairfield-Prest soil complex | PE-F-PR | 36 | |
| Page-Prest-Page:shallow phase soil complex | PE-PR-PE:sp | 55 | 394 |
| Peardonville silt loam-loam | PDsil-l | 200 | |
| Peardonville-Columbia soil complex | PD-CL | 80 | 280 |
| Prest series | PR | 69 | |
| Prest-Fairfield soil complex | PR-F | 23 | |
| Prest-Page soil complex | PR-PE | 53 | 145 |
| Ross series | RS | 106 | |
| Ross silt loam | RSsil | 69 | |
| Ross silty clay loam | RSsicl | 98 | |
| Ross-Judson soil complex | RS-JN | 27 | |
| Ross-Judson:shallow phase soil complex | RS-JN:sp | 32 | |
| Ross-Lehman soil complex | RS-LH | 307 | |
| Ross-Scat soil complex | RS-SC | 63 | 702 |
| Sardis series | SD | 62 | |
| Sardis-Judson soil complex | SD-JN | 81 | |
| Sardis-Lehman soil complex | SD-LH | 86 | |
| Sardis-Lickman:shallow phase soil complex | SD-LK:sp | 12 | 241 |

Table 2 - continued

| Soils | Map Symbol | Acreage | Total |
|---|---|---|---|
| Scat series | SC | 940 | |
| Scat silt loam | SCsil | 34 | |
| Scat clay loam-silty clay loam | SCcl-sicl | 112 | |
| Scat-Boosey soil complex | SC-BY | 10 | |
| Scat-Jackman soil complex | SC-JM | 35 | |
| Scat-Judson soil complex | SC-JN | 84 | |
| Scat-Judson:shallow phase soil complex | SC-JN:sp | 69 | |
| Scat-Nicholson soil complex | SC-N | 229 | |
| Scat-Whatcom soil complex | SC-W | 491 | |
| Scat-Whatcom:shallow phase soil complex | SC-W:sp | 1,938 | |
| Scat-Aldergrove-Jackman soil complex | SC-AE-JM | 246 | |
| Scat-Lehman-Jackman soil complex | SC-LH-JM | 55 | |
| Scat-Nicholson-Whatcom soil complex | SC-N-W | 586 | 4,829 |
| Sim series | SI | 49 | |
| Sim-Annis soil complex | SI-AN | 35 | |
| Sim-McElvee soil complex | SI-ME | 69 | 153 |
| Summer-Heron soil complex | SR-HN | 30 | |
| Summer-Livingstone soil complex | SR-LV | 250 | 280 |
| Sunshine loamy sand | SSls | 100 | |
| Sunshine sandy loam | SSsl | 24 | |
| Sunshine loamy sand-sandy loam | SSls-sl | 340 | |
| Sunshine-Berry soil complex | SS-BR | 101 | |
| Sunshine-Heron soil complex | SS-HN | 720 | |
| Sunshine-Summer soil complex | SS-SR | 62 | |
| Sunshine-Heron-Judson:shallow phase soil complex | SS-HN-JN:sp | 39 | |
| Sunshine-Milner-Judson:shallow phase soil complex | SS-MR-JN:sp | 22 | 1,408 |
| Triggs peat | TR | 816 | |
| Triggs-Gibson soil complex | TR-GN | 53 | 869 |
| Westlang silty clay loam | WLsicl | 491 | |
| Westland-Annis soil complex | WL-AN | 46 | |
| Westlang-Katzie soil complex | WL-KZ | 159 | 696 |
| Whatcom loam | Wl | 161 | |
| Whatcom silt loam | Wsil | 989 | |
| Whatcom:shallow phase | W:sp | 563 | |
| Whatcom-Aldergrove soil complex | W-AE | 220 | |
| Whatcom-Nicholson soil complex | W-N | 247 | |
| Whatcom-Scat soil complex | W-SC | 5,475 | |
| Whatcom-Whatcom:shallow phase soil complex | W-W:sp | 1,027 | |
| Whatcom-Whatcom:anthropic phase soil complex | W-W:an | 270 | |
| Whatcom:shallow phase-Columbia soil complex | W:sp-CL | 490 | |

Table 2 - continued

| Soils | Map Symbol | Acreage | Total |
|---|---|---|---|
| Whatcom:shallow phase-Ross soil complex | W:sp-RS | 229 | |
| Whatcom:shallow phase-Scat soil complex | W:sp-SC | 1,226 | |
| Whatcom:shallow phase-Whatcom soil complex | W:sp-W | 367 | |
| Whatcom-Aldergrove-Jackman soil complex | W-AE-JM | 315 | |
| Whatcom-Aldergrove-Scat soil complex | W-AE-SC | 421 | |
| Whatcom-Nicholson-Scat soil complex | W-N-SC | 4,885 | |
| Whatcom-Scat-Aldergrove soil complex | W-SC-AE | 100 | |
| Whatcom-Scat-Bose soil complex | W-SC-BO | 1,092 | |
| Whatcom-Scat-Jackman soil complex | W-SC-JM | 96 | |
| Whatcom-Scat-Nicholson soil complex | W-SC-N | 2,541 | |
| Whatcom-Scat-Whatcom:shallow phase soil complex | W-SC-W:sp | 1,800 | |
| Whatcom-Whatcom:shallow phase-Nicholson soil complex | W-W:sp-N | 163 | |
| Whatcom-Whatcom:shallow phase-Scat soil complex | W-W:sp-SC | 1,186 | |
| Whatcom:shallow phase-Aldergrove-Scat soil complex | W:sp-AE-SC | 96 | |
| Whatcom:shallow phase-Columbia-Whatcom soil complex | W:sp-CL-W | 191 | |
| Whatcom:shallow phase-Ross-Aldergrove soil complex | W:sp-RS-AE | 39 | |
| Whatcom:shallow phase-Scat-Nicholson soil complex | W:sp-SC-N | 687 | |
| Whatcom:shallow phase-Whatcom-Scat soil complex | W:sp-W-SC | 204 | |
| Whatcom:shallow phase-Whatcom:anthropic phase-Scat soil complex | W:sp-W:an-SC | 98 | |
| Whatcom:anthropic phase-Nicholson-Scat soil complex | W:an-N-SC | 86 | 25,264 |
| **Miscellaneous Land Types** | | | |
| Dykes | | 108 | |
| Gravel Pits | GP | 341 | |
| Highway "401" | | 502 | |
| Ponds | | 46 | |
| Urban Areas | | 1,099 | 2,096 |
| | TOTAL | 81,336 | 81,336 |

Table 3 - Approximate Acreage of Various Parent Materials in Langley Municipality and on Barnston Island.

| Parent Materials | Acreage |
|---|---|
| **Uplands** | |
| Glacio-marine deposits | 34,740 |
| Marine deposits | 8,583 |
| Raised littoral sands over marine or glacio-marine deposits | 3,462 |
| Lag gravels over glacio-marine deposits | 1,273 |
| Glacial outwash | 14,190 |
| Shallow glacial outwash over glacio-marine deposits | 3,641 |
| Shallow aeolian deposits mixed with or over glacial outwash | 2,136 |
| Shallow aeolian deposits over ice-contact deposits | 280 |
| Shallow floodplain deposits over glacial outwash | 70 |
| Stream deposits | 1,596 |
| Organic deposits | 2,057 |
| **Lowlands** | |
| Floodplain deposits - lateral accretion | 2,471 |
| Floodplain deposits - vertical accretion | 306 |
| Floodplain deposits mixed with or over organic deposits | 566 |
| Floodplain deposits mixed with reworded marine deposits | 967 |
| Local stream deposits | 532 |
| Shallow organic deposits | 156 |
| Deep organic deposits | 2,214 |
| Miscellaneous Land Types | 2,096 |
| TOTAL | 81,336 |

## CHEMICAL ANALYSES AND THEIR INTERPRETATION

Chemical analysis data of Langley Municipality-Barnston Island soil profiles is given in Tables 4 and 5. The analyses provide information helpful in the classification of the soils and serve as a general guide to their fertility and management. They are not intended to serve as a basis for specific fertilizer recommendations for any soils on individual farms.

### Methods of Analyses

Soil pH was measured by a glass electrode using a 1:1 suspension of soil in water. The wet combustion method, described by Peach (22), was used to determine soil organic matter. Total nitrogen was determined by the Kjeldahl method described by Atkinson et al (2) and modified by the use of selenium as a catalyst as suggested by Bremner (3). Available phosphorus was obtained by the method described by Laverty (18), modified by John (16). Analyses for exchangeable cations and exchange capacity were undertaken using the method described by Peach (22). Total exchangeable bases were determined on the ammonium acetate extract. Exchangeable potassium and sodium were obtained through use of a Beckman B flame spectrophotometer. Exchangeable calcium plus magnesium was determined by versenate titration with Erichrome Black T indicator. Calcium alone was determined by using Calcon indicator.

## Soil Reaction

Soil reaction or pH, defined as the negative logarithm of hydrogen ion activity in solution, is expressed in values from almost zero to fourteen. Seven represents neutrality. Values below seven express varying degrees of acidity while values above seven indicate varying intensities of alklainity. All Langley Municipality-Barnston Island soils range from pH 4.0 to 7.0.

Plants vary in their ability to grow at different pH values. Although no single factor may be responsible for limiting growth, nutrient availability to various plants at different pH values has significance. For example, in alkaline soils of the semi-arid and arid regions, or when soils are overlimed, growth may be limited by low availability of iron, manganese and zinc. In some acid soils, on the other hand, manganese, iron and aluminum may become soluble to the extent of being toxic to many plants.

In the Lower Fraser Valley, pH alone cannot be used to estimate the amount and frequency of liming. Experimental evidence indicates liming is only necessary to maintain pH 4.8 to 5.0 in soils with ten or more percent organic matter. For soils with lower organic matter content, a pH range of 5.5 to 6.0 is required for most crops. Less lime is required per application on coarse textured soils with low cation exchange capacities than on heavy soils with higher exchange capacities to raise the pH to the same level.

The Fraser River alluvium and the glacio-marine and marine deposits, at the time of deposition, were neutral to basic in reaction. The basic ions, mainly calcium and magnesium, subsequently leached downward producing acid reaction in the surface and moderately acid to alkaline reactions in the lower horizons. Calcium and magnesium accumulation is evident in the C horizons of some glacio-marine soils. It is also observed that pH values tend to decrease with increasing contents of organic matter.

Some soil-borne plant diseases can be controlled by variation in pH since the disease organisms survive only in a relatively narrow pH range.

## Nitrogen

Nitrogen is used in large amounts by plants and is easily lost by leaching. Soil organic matter and commercial fertilizers are the major nitrogen sources although small amounts are washed from the atmosphere by rain.

Under favourable conditions, micro-organisms play an important role in the provision of nitrogen to plants. The ammonifying and nitrifying bacteria convert nitrogen in organic matter and from the atmosphere into forms available for plant nutrition.

The nitrogen content in Fraser Valley soils depends on the organic matter content. In most cases, organic matter accumulation resulted from poor drainage which restricted decomposition. Unless conditions are changed by improved soil drainage and other cultural practices, the release of nitrogen from soils of high organic matter content cannot be expected to be appreciably higher than for soils of lower organic content. In this respect total nitrogen values can hardly be used as a criteria for estimating nitrogen availability.

Only under favourable soil and climatic conditions can total nitrogen values aid in estimating the nitrogen supplying power of the soil. For this purpose, the following levels may serve as a guide:

Very low - $<$0.10 percent
Low - 0.10 to 0.25 percent
Medium - 0.25 to 0.40 percent
High - $>$0.40 percent

## Organic Matter

Organic matter content of soils is related to precipitation, drainage, vegetation, temperature, and other factors. It varies from less than one percent in mineral soils to 100 percent in organic ones. In cultivated mineral soils, organic matter maintenance is of major importance to the farmer.

Organic matter effects the chemical, physical and biological properties of the soil. A large part of the soil nitrogen, phosphorus and sulphur is held in organic combination unavailable to growing plants until released by the activities of soil micro-organisms. Satisfactory organic matter content in the soil insures good micro-organism populations which, in turn, release plant nutrients from the organic matter.

Satisfactory organic matter content in soils makes them less susceptible to crusting, more friable and easier to work, better aerated, and more resistant to erosion. It also increases moisture holding and exchange capacities.

In the Langley Municipality-Barnston Island area most of the poorly drained Gleysolic soils are moderately high to high in organic matter. The well drained Regosolic and Brunisolic soils are moderate to low and the organic matter is rapidly depleted. On these soils, green manure crops and barnyard manure are required to maintain the organic matter status.

## Phosphorus

Phosphorus is a major, essential element for crop growth. Most of it occurs in the soil in forms not immediately available for growing plants; rather is held in varying forms of organic and inorganic compounds. Plants utilize only inorganic forms of phosphorus; organic forms must be mineralized by micro-organisms before plant uptake is possible.

When phosphorus is applied as fertilizer, it does not move far from the point of application. Applications should be placed near the roots to ensure that it will supply the growing plant. Top-dress applications are satisfactory for crops which have an abundance of feeding roots near the surface. For deeper rooted crops, the best results are obtained by drilling the fertilizer with the seed.

Results of two methods of phosphorus analysis are given in this report. The $P_1$ method, considered an index to phosphate availability, extracts the adsorbed forms of iron and aluminum phosphate. The $P_2$ method extracts the above forms as well as most of the acid soluble calcium phosphates. The ratio between $P_2$ and $P_1$ values is useful in delineating soils high in calcium phosphate.

In the Langley Municipality-Barnston Island area, the lowland soils have rather low $P_1$ and high $P_2$ values indicating most of the phosphates exist in the calcium forms. Generally, plant responses can be expected on addition of phosphate fertilizer. In contrast, $P_1$ values of the upland soils are high expressing a high content of iron and aluminum forms of phosphate. Where immediate availability of phosphates is concerned, the well drained upland soils are high, and only limited applications of phosphate fertilizer are required for most crops.

Though plants vary in their demand, the following table may be used as a general guide to available phosphorus in soils, based on the $P_1$ analytical method:

| | | |
|---|---|---|
| Very low | - | $<5$ ppm. |
| Low | - | 5-10 ppm. |
| Moderate | - | 10-20 ppm. |
| Moderately high | - | 20-30 ppm. |
| High | - | $>30$ ppm. |

## Cation Exchange Capacity

The ability of the soil to hold exchangeable cations is termed the cation exchange capacity and is expressed as milli-equivalents of cations required to neutralize the negative charge of 100 grams of soil at pH 7. Depending upon the content of organic matter and the type and content of clay minerals, the cation exchange capacities range from practically nil to over 100 milli-equivalents per 100 grams of soil. The exchange capacity varies from soil to soil as well as from horizon to horizon in the same soil profile. The following values may be used as a guide to the relative levels of the exchange capacities of soils:

| | Milli-equivalents per 100 grams of soil |
|---|---|
| Very low | Less than 5 |
| Low | 5 to 10 |
| Medium | 10 to 20 |
| High | 20 + |

Very high cation exchange capacities occur in the heavy textured soils and those with high organic matter contents. The chemical analyses of soil from the map area indicate a decrease in exchange capacity with coarser textures and/or decrease in organic matter. Most of the soils in the area, however, at least in the surface horizons, have moderately high to high cation exchange capacities.

## Exchangeable Cations

Hydrogen, aluminum, calcium, magnesium, potassium, and sodium are the most abundant exchangeable cations. Their proportions vary from soil to soil depending on soil characteristics and past management practices. Hydrogen and aluminum are the predominant exchangeable cations in acid soils while calcium and magnesium are most common in near neutral soils. Strongly alkaline soils contain large proportions of exchangeable sodium in addition to calcium and magnesium. Exchangeable calcium and magnesium, removed by crops and lost by leaching, are usually replaced by hydrogen and a gradual decrease in reaction occurs.

Exchangeable potassium, as with other cations, is in equilibrium with the fixed forms in the soil. This equilibrium is disturbed when plants remove the exchangeable forms and, to re-establish the equilibrium, some fixed potassium is released. The maintenance of an adequate supply depends upon the reserve and the rate of release. As a guide the following levels of exchangeable potassium may be used:

| | | |
|---|---|---|
| Very low | - | less than 30 parts per million* |
| Low | - | 30 to 60 parts per million |
| Moderate | - | 61 to 90 parts per million |
| Moderately high | - | 91 to 120 parts per million |
| High | - | 121 + |

*To obtain parts per million of potassium from Tables 4, 5 and 6, multiply the value given in the tables by 391.

In the map-area, the chemical analyses indicate that wide variations exist between soils as to the amount of exchangeable cations present. Generally, however, the upland Brunisolic soils are low in exchangeable cations while the Gleysolic upland soils are better supplied. Most lowland soils have higher base saturation percentages than the uplands and are relatively well supplied with calcium and magnesium. Potassium contents are variable. Sodium, toxic when present in high amounts, is present at a low, safe level in all soils.

Chemical analyses of compsite surface samples from some agriculturally important soils are given in Table 6. These indicate similarities that occur within soil series and emphasize variations due to individual farm management. It is noteworthy that, in places, analytical values have been raised higher than can be justified by economic returns. This indicates a wasteful or excessive use of fertilizers.

The fertility status of soils vary from farm to farm and field to field. It is advisable to sample fields with different soils and cultural practises separately for soil testing in order to determine the most economical application rates of fertilizer.

Table 4 - Chemical Analyses of Selected Upland Soil Profiles in Langley Municipality.

| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Exchangeable Cations and Exchange Capacity - me./100 gms. Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Abbotsford loam - Orthic Concretionary Brown** | | | | | | | | | | | | | | |
| L-H | - | 1 - 0 | 5.1 | 89.8 | 1.71 | 30.4 | - | - | - | - | - | - | - | - |
| Bfcc1 | l | 0 - 5 | 5.7 | 3.0 | 0.07 | 24.1 | 32.5 | 86 | 1.25 | | 0.15 | 0.05 | 14.8 | 9.8 |
| Bfcc2 | l | 5 -11 | 5.7 | 1.3 | 0.05 | 15.3 | 18.0 | 34 | 0.69 | | 0.13 | 0.05 | 10.2 | 8.5 |
| Bfcc3 | sl | 11 -17 | 5.7 | 1.5 | 0.04 | 21.1 | 14.5 | 38 | 0.69 | | 0.06 | 0.05 | 10.8 | 7.4 |
| BIIC | ls | 17 -27 | 6.0 | - | - | - | - | - | - | - | - | - | - | - |
| IIC1 | s | 27 -34 | 5.9 | - | - | - | - | - | - | - | - | - | - | - |
| IIC2 | s | 34 + | 6.0 | - | - | - | - | - | - | - | - | - | - | - |
| **Aldergrove loam - Orthic Acid Brown Wooded** | | | | | | | | | | | | | | |
| L-H | - | ½- 0 | 5.6 | 68.9 | 1.81 | 21.2 | - | - | - | - | - | - | - | - |
| Ah | l | 0 - 3 | 5.3 | 12.4 | 0.32 | 22.1 | 47.0 | 115 | 4.89 | 1.03 | 0.17 | Tr. | 30.7 | 19.7 |
| Bf1 | l | 3 -10 | 5.8 | 4.4 | 0.15 | 17.3 | 7.5 | 39 | 1.30 | 0.11 | 0.16 | Tr. | 19.2 | 8.2 |
| Bf2 | gsl-gl | 10 -18 | 5.9 | 2.4 | 0.08 | 16.5 | 13.0 | 90 | 0.66 | | 0.10 | Tr. | 12.3 | 6.2 |
| IICB | gs-gls | 18 -27 | 6.0 | - | 0.08 | - | 37.5 | 164 | 0.46 | | Tr. | Tr. | 7.9 | 5.8 |
| IIC | gs | 27 -38 | 5.9 | - | - | - | 47.5 | 140 | - | - | - | - | - | - |
| IIICgj1 | l-cl | 38 -48 | 5.7 | - | - | - | 47.5 | 82 | - | - | - | - | - | - |
| IIICgj2 | cl | 48 + | 6.0 | - | - | - | - | - | - | - | - | - | - | - |
| **Berry silt loam or clay loam - Gleyed Orthic Acid Brown Wooded** | | | | | | | | | | | | | | |
| Ap | sil-cl | 0 - 8 | 6.1 | 7.2 | 0.29 | 14.4 | 9.0 | 16 | 6.47 | 0.81 | 0.16 | 0.19 | 30.0 | 25.4 |
| Bf | sil-cl | 8 -13 | 6.2 | 2.9 | 0.13 | 12.4 | 3.2 | 11 | 2.26 | 0.76 | 0.13 | 0.14 | 25.0 | 13.2 |
| Bfg | cl-c | 13 -19 | 5.5 | 1.2 | 0.06 | 12.7 | 3.7 | 5 | 4.33 | 4.17 | 0.21 | 0.25 | 28.5 | 31.4 |
| CB | cl-c | 19 -25 | 5.3 | 0.5 | 0.03 | 11.3 | 2.1 | 3 | 7.25 | 10.86 | 0.27 | 0.57 | 39.5 | 48.0 |
| Cg1 | c | 25 -31 | 6.2 | 0.5 | 0.03 | 9.7 | 1.6 | 34 | 13.98 | 19.81 | 0.38 | 1.17 | 43.6 | 81.0 |
| Cg2 | c | 31 -39 | 6.0 | - | - | - | 1.0 | 202 | 13.09 | 18.93 | 0.43 | 1.31 | 39.7 | 85.0 |
| Cg3 | c | 39 -47 | 7.2 | - | - | - | 1.0 | 229 | 10.74 | 14.19 | 0.41 | 1.19 | 30.8 | 86.1 |
| Cg4 | c | 47 + | 7.6 | - | - | - | 3.1 | 230 | 7.97 | 7.67 | 0.29 | 1.07 | 29.6 | 57.4 |

Table 4 - continued

Carvolth silty clay loam or silt loam - Rego Humic Gleysol

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ap | sicl-sil | 0 - 4 | 5.6 | 8.9 | 0.40 | 12.7 | 17.3 | 35 | 7.13 | 2.36 | 0.15 | 0.24 | 30.8 | 32.1 |
| AC | sicl | 4 - 9 | 5.6 | 6.0 | 0.29 | 12.0 | 15.1 | 30 | 4.99 | 1.51 | 0.07 | 0.19 | 27.8 | 24.3 |
| Cg1 | sicl | 9 -15 | 6.0 | 2.5 | 0.13 | 11.0 | 13.6 | 24 | 5.29 | 3.03 | 0.06 | 0.65 | 24.3 | 37.2 |
| Cg2 | sicl | 15 -25 | 6.4 | 1.1 | 0.64 | 9.7 | 17.0 | 29 | 4.48 | 2.70 | 0.06 | 0.86 | 16.1 | 50.3 |
| | | 25 -37 | 6.4 | 1.1 | 0.74 | 8.4 | 37.5 | 71 | 5.89 | 4.69 | 0.09 | 1.10 | 21.6 | 54.5 |
| Cg3 | sic-c | 37 + | 6.4 | 0.9 | 0.55 | 9.4 | 60.1 | 102 | 5.11 | 5.41 | 0.10 | 1.29 | 20.6 | 57.8 |

Cloverdale silty clay loam - Humic Eluviated Gleysol

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ah | sicl | 0 - 6 | 5.6 | 11.5 | 0.48 | 13.7 | 12.1 | 18 | 5.62 | 2.58 | 0.27 | 0.48 | 35.9 | 24.9 |
| Aeg | sil-sicl | 6 -10 | 5.6 | 1.2 | 0.06 | 17.3 | 1.0 | 2 | 4.33 | 4.63 | 0.09 | 0.27 | 17.6 | 53.0 |
| AB | sic | 10 -13 | 5.9 | 0.9 | 0.05 | 10.5 | 1.0 | 2 | 7.26 | 10.13 | 0.15 | 0.57 | 26.3 | 68.9 |
| Btg1 | sic | 13 -19 | 6.7 | 0.7 | 0.03 | 14.2 | 1.0 | 2 | 10.46 | 18.41 | 0.18 | 2.20 | 35.2 | 88.8 |
| Btg2 | sic | 19 -28 | 7.8 | 0.4 | 0.02 | 9.5 | 1.0 | 93 | 10.08 | 16.36 | 0.25 | 4.34 | 35.5 | 87.4 |
| BC | sic | 28 -37 | 7.9 | - | - | - | 1.0 | 145 | 9.88 | 13.69 | 0.27 | 4.08 | 31.9 | 87.5 |
| Cg1 | sic | 37 -48 | 7.8 | - | - | - | 1.0 | 188 | - | - | - | - | 30.7 | - |
| Cg2 | sic | 48 + | 8.0 | - | - | - | 1.6 | 256 | 8.11 | 14.27 | 0.39 | 4.07 | 27.6 | 87.4 |

Columbia sandy loam - Orthic Acid Brown Wooded

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L-H | - | 1½- 0 | 5.3 | 46.5 | 0.81 | 34.0 | - | - | - | - | - | - | - | - |
| Bf1 | sl | 0 - 5 | 5.7 | 4.4 | 0.11 | 22.0 | 51.0 | 142 | 0.94 | 0.58 | 0.06 | 0.06 | 17.0 | 9.7 |
| Bf2 | sl | 5 -12 | 5.8 | 1.7 | 0.06 | 16.2 | 40.5 | 86 | 0.40 | 0.32 | Tr. | 0.05 | 9.6 | 8.0 |
| Bf3 | ls-s | 12 -19 | 5.8 | 1.0 | 0.03 | 18.6 | 37.5 | 68 | 0.26 | 0.19 | Tr. | 0.05 | 6.6 | 7.6 |
| BC | s | 19 -24 | 6.0 | - | 0.01 | - | 44.5 | 116 | 0.39 | 0.12 | Tr. | 0.05 | 2.6 | 21.5 |
| C1 | s | 24 -30 | 6.2 | - | - | - | - | - | - | - | - | - | - | - |
| C2 | g | 30 + | 6.1 | - | - | - | - | - | - | - | - | - | - | - |

Cornock silt loam - Rego Humic Gleysol

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ap | sil | 0 - 8 | 5.6 | 21.8 | 0.96 | 13.2 | 13.5 | - | 11.1 | 1.6 | 0.2 | 0.1 | 56.4 | 23.0 |
| Ah | sil | 8 -12 | 5.3 | 8.4 | 0.41 | 11.9 | 11.5 | - | 1.1 | 0.8 | 0.1 | Tr. | 42.2 | 4.7 |
| Cg | sicl | 12 -14 | 5.2 | 3.5 | 0.20 | 10.1 | 8.5 | - | 1.5 | 0.9 | 0.1 | 0.1 | 31.3 | 8.3 |
| IIAhg | sicl | 14 -18 | 5.1 | 4.6 | 0.27 | 9.8 | 7.5 | - | 1.6 | 1.3 | 0.2 | 0.1 | 33.0 | 9.7 |
| IIIC1 | sl | 18 -31 | 5.4 | 2.2 | 0.12 | 10.6 | 40.5 | - | - | - | - | - | - | - |
| IIIC2 | g | 31 + | 5.6 | 1.2 | 0.07 | 9.7 | 61.0 | - | - | - | - | - | - | - |

Table 4 - continued

| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | P1 ppm. | P2 ppm. | Exchangeable Cations and Exchange Capacity - me./100 gms. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
| **Custer loam or silt loam - Gleyed Ortstein Podzol** | | | | | | | | | | | | | | |
| Ap | l-sil | 0 - 5 | 4.9 | 6.0 | 0.26 | 13.2 | 5.0 | 9 | 2.29 | 0.75 | 0.16 | 0.16 | 17.8 | 18.9 |
| Ae | l-sil | 5 -11 | 5.2 | 2.1 | 0.14 | 8.7 | 26.0 | 37 | 1.27 | 0.30 | Tr. | 0.08 | 12.5 | 13.2 |
| IIBfc | gs | 11 -20 | 5.6 | 3.2 | 0.08 | 22.1 | 25.0 | 56 | 0.35 | 0.19 | Tr. | 0.08 | 18.3 | 3.4 |
| IIBfcg | g | 20 -32 | 5.6 | 3.1 | 0.10 | 16.9 | 13.0 | 48 | 0.39 | 0.13 | Tr. | 0.08 | 17.7 | 3.4 |
| IICg | s | 32 + | 5.7 | - | - | - | - | - | - | - | - | - | - | - |
| **Defehr loam - Gleyed Orthic Acid Brown Wooded** | | | | | | | | | | | | | | |
| Ap | l | 0 - 7 | 5.3 | 10.1 | 0.31 | 18.9 | 22.0 | - | 4.5 | 1.0 | 0.2 | 0.2 | 25.9 | 22.8 |
| Afhgj | gl | 7 -11 | 5.9 | 5.9 | 0.19 | 18.2 | 6.0 | - | 2.0 | 0.7 | 0.2 | 0.1 | 22.9 | 13.1 |
| Bfg | gsl | 11 -17 | 5.8 | 5.1 | 0.15 | 19.9 | 6.5 | - | 1.1 | 0.7 | 0.3 | 0.3 | 20.4 | 11.8 |
| IICg1 | sg | 17 -25 | 5.9 | 3.2 | 0.11 | 22.2 | 9.0 | - | - | - | - | - | - | - |
| IICg2 | sg | 25 + | 5.7 | 2.3 | 0.07 | 27.3 | 18.5 | - | - | - | - | - | - | - |
| **Heron fine sandy loam - Rego Humic Gleysol** | | | | | | | | | | | | | | |
| F | - | 1 - 0 | 4.7 | 53.1 | 3.06 | 10.1 | - | - | - | - | - | - | - | - |
| Ah | fsl | 0 - 6 | 5.0 | 7.5 | 0.34 | 12.9 | - | - | 3.1 | 1.1 | 0.3 | 0.2 | 17.8 | 26.4 |
| AC | sl | 6 - 8 | 5.8 | 1.6 | 0.08 | 11.2 | - | - | 1.8 | 0.4 | 0.1 | 0.2 | 8.1 | 31.4 |
| IICg | s | 8 -16 | 5.8 | 0.4 | 0.03 | 7.6 | - | - | 1.1 | 0.2 | Tr. | 0.1 | 5.3 | 26.3 |
| IIC & IIICg | s-cl | 16 -25 | 5.5 | 0.2 | 0.02 | 8.1 | - | - | 4.5 | 1.8 | 0.1 | 0.2 | 10.7 | 60.8 |
| IIICg | cl-c | 25 + | 5.4 | 0.3 | 0.02 | 10.9 | - | - | 7.7 | 5.5 | 0.2 | 0.3 | 18.0 | 75.6 |

Table 4 - continued

| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Exchangeable Cations and Exchange Capacity - me./100 gms. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
| **Jackman sandy loam or loam - Rego Humic Gleysol** | | | | | | | | | | | | | | |
| Ap | sl-l | 0 - 8 | 5.9 | 5.9 | 0.29 | 11.7 | 59.0 | 117 | 13.38 | 1.72 | 0.19 | 0.09 | 28.2 | 54.5 |
| IICgl | s | 8 -15 | 5.9 | 0.4 | 0.03 | 6.9 | 19.5 | 34 | 2.36 | 0.79 | 0.05 | Tr. | 5.1 | 62.8 |
| IICg2 | s | 15 -23 | 6.3 | - | 0.03 | - | 10.0 | 32 | 2.56 | 1.58 | 0.05 | Tr. | 5.9 | 71.0 |
| IIICgl | sicl-sic | 23 -31 | 6.1 | - | 0.03 | - | 16.0 | 52 | 15.18 | 8.16 | 0.42 | 0.22 | 29.7 | 80.7 |
| IIICg2 | sicl-sic | 31 -41 | 6.2 | - | - | - | 12.5 | 108 | 14.13 | 8.11 | 0.41 | 0.25 | 26.6 | 86.1 |
| IIICg3 | scl-cl | 41 + | 6.5 | - | - | - | - | - | - | - | - | - | - | - |
| **Judson muck - Deep Muck** | | | | | | | | | | | | | | |
| Hp | mu | 0 - 5 | 3.8 | 95.5 | 2.98 | 18.5 | 30.5 | 45 | 10.35 | 3.02 | 0.26 | 0.10 | 109.7 | 12.5 |
| H1 | mu | 5 -11 | 3.9 | 110.7 | 2.42 | 26.4 | 5.5 | 7 | 5.94 | 1.95 | 0.23 | 0.12 | 105.5 | 7.8 |
| H2 | mu | 11 -17 | 4.1 | 147.5 | 1.76 | 37.6 | 4.0 | 6 | 11.32 | 2.70 | 0.16 | 0.20 | 107.7 | 13.4 |
| FL1 | pt | 17 -21 | 4.3 | 143.5 | 1.36 | 48.6 | 4.5 | 6 | 22.16 | 4.70 | 0.20 | 0.20 | 117.3 | 22.4 |
| FL2 | pt | 21 -33 | 4.5 | 107.2 | 1.19 | 52.0 | 3.0 | 3 | 24.83 | 5.11 | 0.09 | 0.20 | 123.1 | 24.6 |
| LF | pt | 33 -41 | 4.6 | 115.5 | 0.99 | 67.5 | 1.5 | 2 | 27.48 | 7.86 | 0.09 | 0.20 | 137.3 | 26.0 |
| | | 41 -46 | 4.7 | 113.4 | 1.23 | 53.4 | 1.5 | 2 | 27.48 | 7.66 | 0.09 | 0.21 | 135.5 | 26.1 |
| L1 | pt | 46 -64 | 5.0 | 107.0 | 2.28 | 27.1 | 1.0 | 2 | 19.28 | 5.80 | 0.09 | 0.21 | 110.0 | 23.1 |
| L2 | pt | 64 + | 5.1 | 98.7 | 2.27 | 25.1 | 1.0 | 2 | 15.69 | 4.96 | 0.11 | 0.21 | 98.3 | 21.3 |
| **Langley silt loam or silty clay loam - Humic Eluviated Gleysol** | | | | | | | | | | | | | | |
| Ap | sil-sicl | 0 - 9 | 5.5 | 29.5 | 0.82 | 15.0 | 4.9 | 9 | 9.57 | 3.87 | 0.31 | 0.19 | 66.1 | 21.1 |
| Ah | sicl-sic | 9 -15 | 5.8 | 12.6 | 0.52 | 13.8 | 4.9 | 10 | 3.00 | 2.45 | 0.14 | 0.27 | 48.8 | 12.0 |
| Aeg | sic | 15 -19 | 5.7 | 4.1 | 0.18 | 13.7 | 4.8 | 8 | 4.63 | 4.49 | 0.09 | 0.41 | 37.0 | 26.0 |
| BA | sic-c | 19 -23 | 5.6 | 1.2 | 0.07 | 12.1 | 1.6 | 2 | 8.51 | 9.44 | 0.10 | 0.68 | 35.4 | 52.9 |
| Btg | c | 23 -28 | 5.8 | 0.8 | 0.04 | 10.3 | 1.6 | 2 | 9.21 | 8.74 | 0.19 | 0.68 | 41.0 | 45.9 |
| | c | 28 -34 | 6.2 | 0.7 | 0.04 | 8.8 | 1.0 | 2 | 13.99 | 15.56 | 0.36 | 1.71 | 48.0 | 65.9 |
| BC | c | 34 -40 | 6.5 | 0.6 | 0.03 | 11.6 | 3.2 | 63 | 15.23 | 15.71 | 0.48 | 2.24 | 42.3 | 79.6 |
| Cgl | c | 40 -51 | 6.7 | 0.4 | 0.03 | 8.0 | 3.7 | 165 | 13.49 | 14.42 | 0.53 | 2.93 | 38.2 | 82.1 |
| Cg2 | c | 51 + | 6.8 | - | - | - | 5.8 | 187 | 11.71 | 12.33 | 0.61 | 3.30 | 39.6 | 70.6 |

Table 4 - continued

| | | | | | | | | | Exchangeable Cations and Exchange Capacity - me./100 gms. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
| **Lehman silt loam - Rego Humic Gleysol** | | | | | | | | | | | | | | |
| L-H | - | 1 - 0 | 4.8 | 98.3 | 1.93 | 29.4 | - | - | - | - | - | - | - | - |
| Ah | sil | 0 - 6 | 4.7 | 20.1 | 0.62 | 18.6 | 3.5 | 17 | 1.85 | 0.43 | 0.16 | 0.28 | 43.5 | 6.2 |
| AC | sil-l | 6 -10 | 5.4 | 3.1 | 0.16 | 11.0 | 5.5 | 19 | 0.67 | 0.19 | Tr. | 0.11 | 27.9 | 3.5 |
| IICgl | gsl-gls | 10 -17 | 5.8 | - | 0.04 | - | 13.0 | 33 | 0.53 | 0.18 | Tr. | 0.06 | 6.1 | 12.6 |
| IICg2 | gs | 17 -36 | 6.0 | - | 0.02 | - | 13.5 | 24 | 0.51 | | Tr. | 0.06 | 2.4 | 23.8 |
| IICg3 | gs | 36 + | 6.0 | - | - | - | - | - | - | - | - | - | - | - |
| **Livingstone silt loam - Rego Humic Gleysol** | | | | | | | | | | | | | | |
| Ap | sil | 0 - 6 | 5.5 | 18.6 | 0.54 | 19.9 | 16.2 | 22 | 2.42 | 1.37 | 0.08 | 0.36 | 33.9 | 12.5 |
| AC | l-sil | 6 - 8 | 5.5 | 6.4 | 0.24 | 15.2 | 9.4 | 24 | 1.35 | | 0.08 | 0.19 | 25.4 | 6.4 |
| Cg | l-sil | 8 -13 | 5.8 | 2.0 | 0.09 | 17.3 | 17.4 | 31 | 1.03 | | Tr. | 0.19 | 12.6 | 9.7 |
| IICgl | s | 13 -19 | 6.4 | - | - | - | 15.7 | 27 | 0.72 | 0.61 | 0.06 | 0.18 | 6.3 | 24.9 |
| IICg2 | s | 19 -25 | 6.6 | - | - | - | 8.1 | 15 | 1.00 | 1.16 | 0.06 | 0.26 | 5.4 | 45.9 |
| IIICgl | c | 25 -37 | 6.5 | - | - | - | 3.1 | 7 | 6.86 | 9.58 | 0.37 | 1.66 | 23.8 | 77.6 |
| IIICg2 | c | 37 + | 6.2 | - | - | - | 12.5 | 89 | 6.92 | 10.11 | 0.47 | 2.26 | 19.5 | 100.0 |
| **Lynden loamy sand - Degraded Acid Brown Wooded** | | | | | | | | | | | | | | |
| L-H | - | 2 - 0 | 5.1 | 58.3 | 1.53 | 22.0 | - | - | - | - | - | - | - | - |
| Ae | ls | 0 - $\frac{3}{4}$ | 4.2 | 3.7 | 0.07 | 30.5 | 15.5 | 25 | 1.01 | 0.15 | Tr. | 0.05 | 11.9 | 10.2 |
| Bfl | ls | $\frac{3}{4}$- 9 | 5.6 | 2.6 | 0.06 | 24.2 | 47.0 | 92 | 0.61 | 0.25 | 0.05 | 0.05 | 11.3 | 8.5 |
| Bf2 | ls | 9 -18 | 5.9 | 1.0 | 0.03 | 18.6 | 26.5 | 54 | 0.39 | 0.25 | 0.05 | 0.05 | 5.6 | 13.2 |
| BC | gs | 18 -22 | 6.0 | 0.3 | 0.01 | 15.9 | 49.5 | 118 | 0.26 | 0.19 | Tr. | 0.05 | 3.0 | 16.7 |
| Cl | gs | 22 -29 | 6.0 | - | - | - | - | - | - | - | - | - | - | - |
| C2 | s | 29 + | 6.0 | - | - | - | - | - | - | - | - | - | - | - |

Table 4 - continued

| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Exchangeable Cations and Exchange Capacity - me./100 gms. Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Marble Hill silt loam - Orthic Acid Brown Wooded | | | | | | | | | | | | | | |
| L-H | - | 1 - 0 | 4.7 | 60.2 | 1.46 | 23.8 | - | - | - | - | - | - | - | - |
| Bfh | sil | 0 - 5 | 5.5 | 7.0 | 0.20 | 20.3 | 46.0 | 148 | 2.16 | 0.62 | 0.18 | 0.12 | 22.2 | 13.9 |
| Bf1 | sil | 5 -12 | 5.6 | 3.4 | 0.12 | 15.3 | 6.5 | 45 | 0.75 | 0.11 | 0.08 | 0.06 | 16.1 | 6.2 |
| Bf2 | sil | 12 -17 | 5.7 | 1.5 | 0.07 | 12.1 | 5.0 | 39 | 0.46 | | 0.05 | 0.05 | 9.9 | 5.7 |
| CB | sil | 17 -20 | 5.8 | 1.2 | 0.05 | 13.7 | 5.0 | 43 | 0.46 | | Tr. | 0.05 | 9.1 | 5.6 |
| C | sil | 20 -31 | 5.7 | 0.9 | 0.04 | 13.1 | 7.0 | 50 | 0.46 | | Tr. | 0.10 | 11.2 | 5.0 |
| CIIC | gsl | 31 -34 | 5.7 | - | - | - | - | - | - | - | - | - | - | - |
| IIC1 | s | 34 -48 | 5.9 | - | - | - | - | - | - | - | - | - | - | - |
| IIC2 | gs | 48 + | 5.8 | - | - | - | - | - | - | - | - | - | - | - |
| Milner silt loam or loam - Orthic Concretionary Brown | | | | | | | | | | | | | | |
| L | - | 2 - 1 | - | - | - | - | >100 | > 300 | - | - | - | - | - | - |
| HF | - | 1 - 0 | 4.1 | 37.3 | 1.30 | 18.8 | 85.9 | 128 | - | - | - | - | - | - |
| Bfhcc | sil-l | 0 -10 | 5.1 | 5.4 | 0.20 | 17.3 | 41.4 | 112 | 1.23 | 0.49 | 0.32 | 0.09 | 35.5 | 6.0 |
| Bfcc | sil-cl | 10 -19 | 5.2 | 3.5 | 0.10 | 14.1 | 18.5 | 102 | 0.29 | 0.37 | 0.19 | 0.09 | 30.7 | 3.1 |
| Bf | cl | 19 -23 | 4.9 | 0.9 | 0.10 | 19.9 | 18.8 | 39 | 3.60 | 2.46 | 0.24 | 0.14 | 30.0 | 21.5 |
| C1 | cl-c | 23 -35 | 4.9 | - | Tr. | 7.4 | 16.9 | 32 | 10.07 | 8.82 | 0.32 | 0.30 | 35.0 | 55.7 |
| C2 | c | 35 + | 6.4 | - | Tr. | 10.0 | 6.3 | 116 | 14.48 | 10.57 | 0.34 | 0.41 | 34.6 | 74.6 |
| Murrayville loam - Orthic Acid Brown Wooded | | | | | | | | | | | | | | |
| Bf1 | l | 0 - 6 | 5.5 | 3.9 | 0.13 | 17.5 | 10.4 | 31 | 0.92 | | 0.10 | 0.45 | 16.5 | 8.9 |
| Bf2 | fsl | 6 -12 | 5.9 | 2.3 | 0.08 | 14.7 | 15.0 | 45 | 0.67 | | 0.05 | 0.09 | 11.5 | 7.0 |
| IIBf | lfs | 12 -20 | 5.9 | 1.4 | 0.06 | 13.7 | 12.9 | 54 | 0.59 | | 0.05 | 0.14 | 6.8 | 11.5 |
| IIICgj | cl | 20 -24 | 5.3 | 0.9 | 0.04 | 13.0 | 2.1 | 2 | 1.50 | 2.10 | 0.08 | 0.19 | 19.3 | 20.1 |
| IIICg1 | c | 24 -29 | 5.2 | 0.6 | 0.03 | 10.6 | 1.0 | 2 | 3.02 | 3.78 | 0.16 | 0.39 | 24.3 | 30.2 |
| IIICg2 | c | 29 -36 | 5.7 | 0.6 | 0.03 | 13.0 | 2.1 | 7 | 9.99 | 15.23 | 0.36 | 1.16 | 38.5 | 69.5 |
| IIICg3 | c | 36 -48 | 7.1 | 0.4 | 0.03 | 8.6 | 2.1 | 45 | 11.32 | 18.36 | 0.36 | 1.68 | 36.9 | 86.0 |
| IIICg4 | c | 48 + | 7.3 | 0.3 | 0.02 | 8.4 | 8.4 | 52 | 11.65 | 18.09 | 0.38 | 2.14 | 37.2 | 88.9 |

Table 4 - continued

| | | | | | | | | | Exchangeable Cations and Exchange Capacity - me./100 gms. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
| **Nicholson silt loam - Orthic Concretionary Brown** | | | | | | | | | | | | | | |
| L-H | - | 1 - 0 | 4.8 | 77.0 | 1.97 | 22.6 | - | - | - | - | - | - | - | - |
| Bfhcc | sil | 0 - 4 | 5.7 | 5.8 | 0.17 | 20.1 | 5.5 | 15 | 2.65 | 1.08 | 0.43 | 0.06 | 22.1 | 19.1 |
| Bfcc1 | sil | 4 -13 | 6.0 | 2.5 | 0.08 | 17.5 | 2.0 | 9 | 0.66 | 0.72 | 0.14 | 0.06 | 16.4 | 9.6 |
| Bfcc2 | sil | 13 -25 | 5.9 | 1.9 | 0.06 | 17.1 | 2.0 | 8 | 0.40 | 0.61 | Tr. | 0.17 | 15.5 | 7.6 |
| Bfcc3 | sil-sicl | 25 -31 | 5.9 | 1.5 | 0.05 | 16.2 | 2.0 | 8 | 0.13 | 0.56 | Tr. | 0.10 | 15.8 | 5.0 |
| Cgj1 | cl | 31 -37 | 5.8 | - | 0.02 | - | 2.0 | 14 | 6.91 | 5.40 | 0.06 | 0.23 | 16.6 | 75.9 |
| Cgj2 | sic | 37 -45 | 6.4 | - | - | - | - | - | - | - | - | - | - | - |
| C | sic | 45 + | 6.7 | - | - | - | - | - | - | - | - | - | - | - |
| **Peardonville silt loam - Orthic Acid Brown Wooded** | | | | | | | | | | | | | | |
| L-H | - | 1 - 0 | 4.7 | 44.2 | 1.59 | 16.1 | 214.5 | - | - | - | - | - | - | - |
| Bfh | sil | 0 - 6 | 5.4 | 6.0 | 0.22 | 15.7 | 233.0 | - | 2.9 | 0.6 | 0.1 | 0.1 | 23.0 | 16.1 |
| Bf | l | 6 -12 | 5.5 | 4.5 | 0.16 | 16.3 | 99.0 | - | 0.5 | 0.7 | 0.1 | Tr. | 18.5 | 7.0 |
| BIIC | sl | 12 -23 | 5.9 | 1.4 | 0.05 | 15.6 | 29.5 | - | - | - | - | - | - | - |
| IIC1 | ls | 23 -44 | 6.1 | - | - | - | 33.0 | - | - | - | - | - | - | - |
| IIC2 | s-g | 44 + | 6.2 | - | - | - | 90.0 | - | - | - | - | - | - | - |
| **Ross silt loam - Rego Humic Gleysol** | | | | | | | | | | | | | | |
| Ah | sil | 0 - 9 | 4.7 | 12.4 | 0.63 | 11.4 | 22.0 | - | 5.7 | 1.4 | 0.2 | 0.2 | 37.4 | 20.1 |
| AC | sil | 9 -13 | 5.3 | 1.8 | 0.15 | 6.9 | 48.0 | - | 6.2 | 1.9 | Tr. | 0.3 | 23.3 | 36.1 |
| Cg1 | sicl | 13 -22 | 5.4 | 0.5 | 0.04 | 8.0 | 15.0 | - | 7.4 | 4.2 | 0.1 | 0.5 | 17.9 | 68.2 |
| Cg2 | sic | 22 + | 6.2 | 0.5 | 0.04 | 8.0 | 7.5 | - | 12.6 | 8.9 | 0.1 | 0.5 | 24.1 | 91.7 |
| **Scat silty clay loam - Rego Humic Gleysol** | | | | | | | | | | | | | | |
| L-H | - | ½- 0 | 4.4 | 75.2 | 1.06 | 42.4 | - | - | - | - | - | - | - | - |
| Ah | sicl | 0 - 5 | 5.3 | 18.9 | 0.76 | 14.5 | 70.0 | 187 | 3.81 | 1.21 | 0.26 | 0.14 | 46.1 | 11.8 |
| Cg1 | sic | 5 -11 | 5.6 | 0.7 | 0.04 | 9.2 | 1.0 | 2 | 7.32 | 6.11 | 0.27 | 0.19 | 23.5 | 59.1 |
| Cg2 | sic | 11 -18 | 6.0 | - | 0.03 | - | 3.0 | 7 | 12.28 | 10.61 | 0.30 | 0.29 | 30.0 | 78.3 |
| Cg3 | sic-c | 18 -26 | 6.5 | - | 0.03 | - | 2.5 | 88 | 14.43 | 12.55 | 0.32 | 0.37 | 31.6 | 87.6 |
| Cg4 | sic-c | 26 + | 6.8 | - | 0.02 | - | 1.5 | 205 | 12.31 | 12.12 | 0.31 | 0.30 | 29.4 | 85.1 |

Table 4 - continued

| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Exchangeable Cations and Exchange Capacity - me./100 gms.<br>Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Summer fine sandy loam - Gleyed Ortstein Podzol** | | | | | | | | | | | | | | |
| L-H | - | 1 - 0 | 4.4 | 81.6 | 1.73 | 27.3 | - | - | - | - | - | - | - | - |
| Ahe | fsl | 0 - 5 | 4.2 | 6.9 | 0.26 | 15.4 | 6.5 | 7 | 1.54 | 0.49 | 0.05 | 0.06 | 18.8 | 11.4 |
| Ae | ls | 5 - 9 | 4.8 | 2.2 | 0.10 | 12.4 | 8.0 | 10 | 1.01 | 0.43 | Tr. | 0.05 | 8.2 | 18.2 |
| Bfhc | sl | 9 -13 | 5.3 | 5.7 | 0.15 | 22.6 | 3.5 | 19 | 1.15 | 0.37 | Tr. | 0.09 | 18.2 | 8.9 |
| Bfcgj | ls | 13 -22 | 5.5 | 3.0 | 0.07 | 23.7 | 8.5 | 30 | 0.67 | 0.44 | Tr. | 0.11 | 15.0 | 8.1 |
| CB | fs | 22 -28 | 5.6 | 0.9 | 0.03 | 17.5 | 26.5 | 49 | 0.60 | 0.41 | Tr. | 0.11 | 6.7 | 16.7 |
| Cg | lfs | 28 -38 | 5.8 | 0.3 | 0.02 | 8.0 | 4.0 | 12 | 2.04 | 1.18 | Tr. | 0.22 | 6.9 | 49.9 |
| IICg1 | c | 38 -46 | 5.9 | - | - | - | - | - | - | - | - | - | - | - |
| IICg2 | c | 46 + | 6.2 | - | - | - | - | - | - | - | - | - | - | - |
| **Sunshine sandy loam - Orthic Acid Brown Wooded** | | | | | | | | | | | | | | |
| LF | - | 1 - 0 | 4.8 | 37.1 | 0.79 | 27.3 | - | - | - | - | - | - | - | - |
| Bf1 | sl | 0 -10 | 5.7 | 3.9 | 0.12 | 18.6 | - | - | 1.4 | 0.3 | 0.1 | 0.1 | 15.4 | 12.4 |
| Bf2 | sl | 10 -20 | 5.7 | 2.5 | 0.08 | 17.5 | - | - | 0.7 | 0.2 | 0.1 | 0.1 | 11.7 | 9.2 |
| Bf3 | sl-ls | 20 -30 | 5.8 | 1.2 | 0.04 | 18.5 | - | - | 0.8 | 0.3 | Tr. | 0.1 | 7.3 | 16.1 |
| BC | s | 30 -38 | 5.7 | 0.4 | 0.02 | 13.9 | - | - | 0.4 | 0.2 | Tr. | 0.1 | 8.9 | 7.6 |
| Cg | s-l | 38 -66 | 6.0 | - | - | - | - | - | - | - | - | - | - | - |
| **Whatcom silt loam - Orthic Acid Brown Wooded** | | | | | | | | | | | | | | |
| LF | - | ½- 0 | 4.5 | 88.0 | 2.09 | 24.3 | - | - | - | - | - | - | - | - |
| Bhf | sil | 0 - 3 | 5.4 | 13.2 | 0.44 | 17.4 | 18.5 | 56 | 3.89 | 1.06 | 0.35 | Tr. | 32.5 | 16.3 |
| Bfh | sil | 3 - 9 | 5.0 | 5.8 | 0.19 | 18.0 | 5.0 | 28 | 0.75 | 0.25 | 0.16 | Tr. | 22.8 | 5.1 |
| Bf1 | sil | 9 -17 | 5.1 | 3.6 | 0.13 | 15.4 | 5.0 | 28 | 0.40 | 0.25 | 0.10 | Tr. | 19.2 | 3.9 |
| Bf2 | sil | 17 -24 | 5.4 | 4.4 | 0.16 | 16.1 | 11.5 | 40 | 0.95 | 0.39 | 0.08 | 0.05 | 22.5 | 6.5 |
| BC | sil | 24 -28 | 5.5 | 2.5 | 0.10 | 14.0 | 16.0 | 37 | 1.15 | 0.57 | 0.08 | 0.05 | 20.6 | 8.9 |
| Cg1 | cl | 28 -38 | 6.0 | - | - | - | - | - | - | - | - | - | - | - |
| Cg2 | cl-c | 38 + | 6.3 | - | - | - | - | - | - | - | - | - | - | - |

Tr. - Trace
> - Greater than

Table 5 - Chemical Analyses of Selected Lowland Soil Profiles in Langley Municipality and on Barnston Island.

| | | | | | | | | | Exchangeable Cations and Exchange Capacity me./100 gms. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
| Annis muck - Rego Gleysol | | | | | | | | | | | | | | |
| Hp | mu | 10- 2 | 5.2 | 56.5 | 1.77 | 19.1 | 50.3 | 78 | 26.7 | 3.3 | 0.3 | 0.3 | 86.6 | 35.3 |
| FH | mu | 2- 0 | 4.7 | 94.9 | 2.44 | 22.5 | 11.8 | 18 | 12.5 | 2.3 | 0.2 | 0.2 | 125.5 | 12.1 |
| Cg1 | sicl | 0- 4 | 5.1 | 8.8 | 0.32 | 15.6 | 8.3 | 25 | 14.4 | 4.8 | 0.2 | 0.3 | 47.5 | 41.5 |
| Cg2 | sicl | 4- 8 | 5.4 | 1.8 | 0.10 | 11.0 | 7.5 | 23 | 11.3 | 5.7 | 0.2 | 0.6 | 31.0 | 57.4 |
| Cg3 | sicl | 8+ | 6.1 | 0.5 | 0.04 | 8.4 | 4.4 | 54 | 11.8 | 2.6 | 0.1 | 1.0 | 20.2 | 70.4 |
| Banford muck - Shallow Muck | | | | | | | | | | | | | | |
| Hp | mu | 23-16 | 4.3 | 55.8 | 1.99 | 16.3 | 30.0 | 54 | 4.3 | 1.2 | 0.5 | 0.3 | 81.7 | 7.7 |
| FH | mu | 16-11 | 4.2 | 91.2 | 2.28 | 23.2 | 5.0 | 12 | 3.9 | 1.3 | 0.2 | 0.3 | 52.4 | 10.9 |
| H | musi | 11- 0 | 4.7 | 38.0 | 0.96 | 22.9 | 1.0 | 12 | 7.6 | 3.7 | 0.2 | 0.2 | 62.8 | 18.6 |
| Cg1 | sicl | 0-14 | 4.7 | 8.1 | 0.31 | 15.3 | 3.4 | 11 | 8.6 | 3.6 | 0.1 | 0.2 | 32.2 | 38.8 |
| Cg2 | sil | 14+ | 4.6 | - | - | - | - | - | 11.8 | 6.4 | 0.2 | 0.3 | 29.4 | 63.6 |
| Bates silt loam - Gleyed Mull Regosol | | | | | | | | | | | | | | |
| Ap | sil | 0- 7 | 5.2 | 17.9 | 0.88 | 11.9 | 10.9 | 22 | 4.8 | 1.6 | 0.2 | 0.3 | 49.9 | 13.8 |
| Cgj | sil | 7-14 | 5.4 | 2.5 | 0.12 | 11.6 | 16.8 | 29 | 3.5 | 1.4 | 0.1 | 0.1 | 23.8 | 21.4 |
| Cg1 | sicl | 14-26 | 5.4 | 0.9 | 0.05 | 9.4 | 21.4 | 41 | 7.8 | 1.4 | 0.1 | 0.2 | 20.3 | 46.8 |
| Cg2 | sicl | 26+ | 5.5 | 0.6 | 0.04 | 9.0 | 16.6 | 43 | 9.0 | 2.6 | 0.1 | 0.2 | 14.6 | 81.5 |

Table 5 - continued

| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Exchangeable Cations and Exchange Capacity me./100 gms. Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fairfield silt loam - Gleyed Mull Regosol** | | | | | | | | | | | | | | |
| Ap | sil | 0- 7 | 5.2 | 5.5 | 0.25 | 12.4 | 16.0 | 29 | 3.38 | 2.65 | 0.05 | 0.09 | 23.5 | 26.3 |
| Cgj1 | sil | 7-11 | 5.7 | 2.2 | 0.12 | 10.4 | 13.5 | 27 | 1.80 | 0.36 | Tr. | 0.06 | 13.8 | 16.1 |
| Cgj2 | sil | 11-18 | 5.7 | 0.9 | 0.05 | 10.5 | 16.5 | 29 | 2.12 | 0.67 | Tr. | 0.09 | 10.7 | 26.9 |
| Cg1 | sil | 18-30 | 5.7 | - | - | - | 9.5 | 23 | 4.39 | 1.35 | Tr. | 0.08 | 11.4 | 51.1 |
| IICg | lfs-fsl | 30-40 | 5.9 | - | - | - | - | - | - | - | - | - | - | - |
| Cg2 | sil | 40+ | 5.7 | - | - | - | - | - | - | - | - | - | - | - |
| **Gibson muck - Deep Muck** | | | | | | | | | | | | | | |
| Hp | mu | 0- 5 | 4.0 | 38.7 | 1.33 | 16.8 | 7.5 | 22 | 2.20 | | 0.08 | 0.19 | 56.2 | 4.4 |
| FH1 | mu | 5-11 | 4.1 | 86.1 | 2.53 | 19.6 | 5.0 | 7 | 1.84 | 0.23 | 0.06 | 0.20 | 90.4 | 2.6 |
| FH2 | mu | 11-16 | 4.6 | 82.6 | 2.43 | 19.6 | 3.5 | 5 | 6.45 | 0.31 | 0.06 | 0.15 | 92.6 | 7.5 |
| F1 | pt | 16-26 | 4.8 | 87.0 | 2.04 | 24.6 | 3.0 | 4 | 7.81 | 2.58 | 0.06 | 0.31 | 91.0 | 11.8 |
| F2 | pt | 26-38 | 5.0 | 40.4 | 0.84 | 27.9 | 5.0 | 17 | 7.33 | 2.62 | 0.05 | 0.27 | 60.2 | 17.1 |
| L | pt | 38+ | 4.8 | 52.3 | 0.97 | 31.1 | 10.0 | 23 | 7.46 | 2.52 | Tr. | 0.33 | 73.6 | 14.0 |
| **Grevell sand - Orthic Regosol** | | | | | | | | | | | | | | |
| C1 | s | 0- 9 | 7.1 | 0.2 | 0.02 | 7.5 | 2.5 | 71 | 5.3 | | 0.2 | 0.1 | 4.3 | 100.0 |
| C2 | lfs | 9-12 | 7.3 | 0.4 | 0.02 | 11.9 | 2.2 | 106 | 8.0 | | 0.2 | 0.1 | 7.8 | 100.0 |
| Cgj | s | 12-22 | 7.4 | 0.7 | 0.04 | 10.1 | 2.5 | 57 | 4.4 | 0.8 | 0.1 | 0.1 | 5.7 | 94.7 |
| C3 | s | 22+ | 7.4 | 0.2 | 0.01 | 9.2 | 2.2 | 54 | 3.6 | | 0.1 | 0.1 | 3.5 | 100.0 |

Table 5 - continued

| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Exchangeable Cations and Exchange Capacity me./100 gms. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
| **Hallert muck - Rego Gleysol** | | | | | | | | | | | | | | |
| Hp | mu | 9- 3 | 4.0 | 46.6 | 1.39 | 19.3 | 32.5 | 81 | 0.72 | 0.26 | 0.15 | 0.22 | 68.1 | 2.0 |
| H | mu | 3- 0 | 4.2 | 58.8 | 1.62 | 21.0 | 7.0 | 15 | 1.59 | | 0.09 | 0.20 | 87.5 | 2.2 |
| Cg | sicl | 0-13 | 4.5 | 27.9 | 0.81 | 19.9 | 3.5 | 23 | 0.71 | 0.89 | 0.05 | 0.22 | 66.2 | 2.8 |
| F | simu | 13-18 | 4.9 | 34.2 | 0.87 | 22.6 | 3.0 | 19 | 5.46 | 1.27 | 0.08 | 0.15 | 62.0 | 11.2 |
| L & Cg | pt-si | 18-31 | 5.0 | 28.3 | 0.63 | 25.9 | 3.5 | 23 | 10.72 | 3.82 | 0.14 | 0.17 | 61.1 | 24.3 |
| L | pt | 31-43 | 4.9 | 61.7 | 1.13 | 31.5 | 4.0 | 12 | 6.77 | 1.56 | 0.07 | 0.33 | 79.5 | 11.0 |
| Cg & L | pt-sicl | 43+ | 5.1 | 21.1 | 0.48 | 25.1 | 6.5 | 63 | 9.53 | 2.50 | 0.06 | 0.30 | 46.0 | 26.9 |
| **Hazelwood silty clay loam - Orthic Humic Gleysol** | | | | | | | | | | | | | | |
| Ap | sicl | 0- 9 | 4.8 | 25.3 | 0.98 | 16.0 | 21.3 | 41 | 5.5 | 1.8 | 0.3 | 0.3 | 59.3 | 13.3 |
| AB | sicl | 9-14 | 5.1 | 11.6 | 0.32 | 20.0 | 6.3 | 12 | 10.1 | 3.6 | 0.1 | 0.2 | 39.8 | 35.2 |
| Btg | sic | 14-24 | 5.2 | 2.6 | 0.10 | 13.8 | 4.4 | 11 | 11.8 | 5.2 | 0.2 | 0.2 | 30.7 | 55.0 |
| Cg | sicl | 24-29 | 5.5 | 1.1 | 0.06 | 11.4 | 4.1 | 21 | 7.1 | 3.8 | 0.1 | 0.1 | 17.6 | 63.1 |
| IICg1 | vfsl | 29-36 | 5.7 | 0.8 | 0.06 | 8.2 | 5.4 | 23 | 4.3 | 2.3 | Tr. | 0.1 | 10.2 | 65.8 |
| IICg2 | ls | 36+ | 5.9 | 1.1 | 0.06 | 11.2 | 5.4 | 24 | 3.1 | 2.0 | Tr. | 0.1 | 7.4 | 70.3 |
| **Hjorth silty clay loam - Rego Humic Gleysol** | | | | | | | | | | | | | | |
| Ap | sicl | 0- 8 | 5.5 | 9.2 | 0.38 | 14.0 | 14.0 | 38 | 4.38 | 2.07 | 0.40 | 0.11 | 33.3 | 20.9 |
| Cg1 | sicl | 8-15 | 5.9 | 2.6 | 0.14 | 11.3 | 10.0 | 21 | 4.75 | 1.68 | 0.09 | 0.15 | 21.2 | 31.5 |
| Cg2 | sicl | 15-23 | 6.0 | 0.7 | 0.05 | 8.3 | 24.5 | 42 | 4.67 | 1.32 | 0.05 | 0.09 | 11.6 | 52.9 |
| Cg3 | sicl | 23-37 | 5.9 | - | - | - | 18.5 | 33 | 4.32 | 1.18 | 0.05 | 0.10 | 10.6 | 53.3 |
| IICg | fs-lfs | 37+ | 5.8 | - | - | - | - | - | - | - | - | - | - | - |

Table 5 - continued

| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Exchangeable Cations and Exchange Capacity me./100 gms. Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Katzie silty clay loam - Rego Humic Gleysol** | | | | | | | | | | | | | | |
| Ap | sicl | 0- 8 | 5.5 | 14.2 | 0.75 | 11.0 | 16.7 | 33 | 7.29 | 1.10 | 0.23 | 0.14 | 50.2 | 18.7 |
| Ah | sicl-sic | 8-15 | 6.5 | 5.0 | 0.22 | 13.2 | 12.2 | 18 | 7.34 | 2.13 | 0.07 | 0.14 | 38.1 | 26.2 |
| Cg1 | sic | 15-22 | 5.7 | 1.1 | 0.07 | 10.0 | 6.1 | 9 | 9.81 | 4.56 | 0.08 | 0.17 | 24.4 | 58.2 |
| Cg2 | sic | 22-32 | 5.9 | 0.9 | 0.05 | 10.3 | 6.8 | 11 | 12.67 | 6.16 | 0.1 | 0.3 | 29.3 | 68.3 |
| Cg3 | sic-c | 32-43 | 6.1 | - | - | - | 7.8 | 35 | 11.44 | 8.27 | 0.1 | 0.2 | 27.5 | 70.5 |
| Cg4 | sic | 43+ | 6.3 | - | - | - | 7.8 | 28 | 11.96 | 7.56 | 0.1 | 0.2 | 28.2 | 72.3 |
| **Lickman silt loam - Mull Regosol** | | | | | | | | | | | | | | |
| Ap | sil | 0- 7 | 6.3 | 8.1 | 0.34 | 13.7 | 21.6 | 43 | 3.8 | | 0.1 | 0.3 | 24.2 | 17.4 |
| IIC | lfs | 7-17 | 6.1 | 1.5 | 0.08 | 10.4 | 47.1 | 63 | 1.5 | 0.3 | 0.1 | 0.2 | 10.9 | 19.3 |
| C | fsl | 17-22 | 5.7 | 0.9 | 0.05 | 9.2 | 44.8 | 59 | 1.2 | 0.2 | 0.1 | 0.2 | 8.1 | 21.0 |
| Cgj | l | 22-28 | 5.7 | 0.8 | 0.05 | 10.6 | 24.7 | 42 | 2.6 | 0.7 | Tr. | 0.2 | 10.0 | 35.0 |
| Cg | sl | 28+ | 5.8 | 0.5 | 0.04 | 7.9 | 26.1 | 55 | 2.6 | 0.9 | Tr. | 0.2 | 7.9 | 46.8 |
| **McElvee loam - Rego Gleysol** | | | | | | | | | | | | | | |
| Ap | l | 0- 6 | 5.6 | 4.5 | 0.22 | 11.9 | 8.1 | 28 | 4.2 | 0.6 | 0.1 | 0.2 | 15.9 | 32.1 |
| Cg1 | sil | 6-13 | 5.6 | 1.6 | 0.08 | 11.6 | 16.1 | 68 | 3.5 | 0.5 | 0.1 | 0.2 | 12.3 | 35.0 |
| IICg1 | ls | 13-16 | 5.8 | 0.9 | 0.05 | 10.5 | 11.2 | 61 | 2.9 | 0.6 | Tr. | 0.2 | 7.8 | 47.4 |
| Cg2 | sil | 16-28 | 5.7 | 2.8 | 0.15 | 10.6 | 14.4 | 44 | 6.7 | 1.0 | 0.1 | 0.2 | 20.3 | 39.4 |
| Cg3 | scl | 30+ | 5.8 | 0.8 | 0.06 | 10.6 | 22.0 | 59 | 2.4 | 0.6 | Tr. | 0.1 | 7.5 | 41.3 |

Table 5 - continued

| | | | | | | | | | Exchangeable Cations and Exchange Capacity me./100 gms. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
| Monroe silt loam - Mull Regosol | | | | | | | | | | | | | | |
| Ap | sil | 0- 4 | 5.5 | 10.1 | 0.46 | 12.7 | 8.0 | 26 | 12.03 | 3.61 | 1.36 | 0.12 | 30.8 | 55.6 |
| C1 | sil-sicl | 4-12 | 5.8 | 2.6 | 0.15 | 9.8 | 6.0 | 42 | 6.98 | 2.36 | 0.39 | 0.17 | 18.7 | 52.9 |
| | sil-sicl | 12-15 | 5.8 | 1.8 | 0.09 | 11.0 | 7.5 | 59 | - | - | - | - | 16.6 | - |
| C2 | sil-sicl | 15-24 | 5.8 | 1.6 | 0.08 | 11.0 | 13.5 | 61 | 7.22 | 1.89 | 0.30 | 0.14 | 17.4 | 54.9 |
| Cgj1 | vfsl | 24-30 | 6.0 | - | - | - | - | - | - | - | - | - | - | - |
| Cgj2 | sil | 30-38 | 6.1 | - | - | - | - | - | - | - | - | - | - | - |
| Cgj3 | sil | 38+ | 6.0 | - | - | - | - | - | - | - | - | - | - | - |
| Niven silty clay loam - Rego Humic Gleysol | | | | | | | | | | | | | | |
| Ap | sicl | 0- 5 | 5.2 | 9.9 | 0.45 | 12.9 | 11.0 | 45 | 7.81 | 2.03 | 0.16 | 0.15 | 26.1 | 38.9 |
| Cg1 | sicl | 5- 8 | 5.2 | 9.4 | 0.33 | 16.3 | 10.0 | 31 | 4.53 | 1.50 | 0.06 | 0.10 | 28.9 | 21.4 |
| Cg2 | sicl | 8-12 | 5.2 | 12.8 | 0.44 | 16.8 | 7.5 | 23 | 5.18 | 1.57 | 0.08 | 0.12 | 37.7 | 18.4 |
| H & Cg | sicl-mu | 12-17 | 5.2 | 31.1 | 0.85 | 21.1 | 6.5 | 13 | 8.56 | 3.04 | 0.09 | 0.07 | 59.3 | 19.8 |
| FH1 | mu | 17-21 | - | 64.7 | 1.79 | 20.9 | 3.5 | 6 | 15.02 | 5.10 | Tr. | 0.16 | 84.5 | 24.0 |
| FH2 | simu | 21-27 | - | 52.3 | 1.53 | 19.7 | 3.0 | 4 | 10.74 | 3.19 | 0.09 | 0.15 | 70.7 | 20.0 |
| L & Cg | pt-sicl | 27+ | - | 59.3 | 1.45 | 23.7 | 2.5 | 6 | 13.08 | 5.08 | 0.14 | 0.23 | 74.5 | 24.9 |
| Page silty clay loam - Rego Gleysol | | | | | | | | | | | | | | |
| Ap | sicl | 0- 7 | 5.2 | 5.3 | 0.27 | 11.4 | 27.0 | 81 | 2.96 | 1.20 | 0.31 | 0.10 | 24.7 | 18.5 |
| Cg1 | sicl | 7-13 | 5.5 | 1.0 | 0.07 | 8.4 | 19.0 | 34 | 4.60 | 1.36 | 0.31 | 0.10 | 17.4 | 36.6 |
| Cg2 | sicl | 13-19 | 5.5 | 0.6 | 0.04 | 9.2 | 7.0 | 15 | 5.46 | 1.60 | 0.32 | 0.09 | 15.2 | 49.2 |
| Cg3 | sil | 19-26 | 5.7 | 0.6 | - | - | 8.5 | 23 | 5.39 | 1.26 | 0.15 | 0.16 | 12.3 | 56.6 |
| Cg4 | fsl | 26-34 | 5.7 | - | - | - | - | - | - | - | - | - | - | - |
| Cg5 | sil | 34-39 | 5.7 | - | - | - | - | - | - | - | - | - | - | - |
| IICg | fs-lfs | 39+ | 5.7 | - | - | - | - | - | - | - | - | - | - | - |

Table 5 - continued

| | | | | | | | | | Exchangeable Cations and Exchange Capacity me./100 gms. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Horizon | Texture | Depth (Inches) | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
| Prest silty clay loam - Rego Gleysol | | | | | | | | | | | | | | |
| L-H | - | 3- 0 | 4.5 | 68.2 | - | - | 25.4 | 50 | 6.6 | 2.9 | 1.3 | 0.2 | 36.4 | 30.2 |
| Cg1 | sicl | 0-10 | 5.4 | 4.3 | 0.23 | 11.0 | 5.4 | 100 | 8.2 | 5.0 | 0.4 | 0.2 | 24.4 | 56.6 |
| Cg2 | sic | 10-18 | 5.7 | 2.5 | 0.13 | 11.2 | 4.7 | 147 | 6.7 | 5.6 | 0.3 | 0.2 | 17.5 | 73.1 |
| IICg | lfs | 18-27 | 6.4 | 0.9 | 0.11 | 4.6 | 3.8 | 90 | 4.0 | 3.0 | 0.1 | 0.2 | 7.0 | 100.0 |
| Sim silty clay - Rego Humic Gleysol | | | | | | | | | | | | | | |
| Ap | sic | 0- 8 | 5.2 | 14.7 | 0.70 | 12.4 | 49.3 | 86 | 4.23 | 0.87 | 0.19 | 0.13 | 47.8 | 11.3 |
| Cg1 | sic | 8-11 | 5.4 | 4.6 | 0.22 | 12.0 | 55.5 | 92 | 3.67 | 1.39 | 0.06 | 0.18 | 28.1 | 18.9 |
| Cg2 | sic | 11-19 | 5.4 | 3.2 | 0.14 | 13.4 | 37.3 | 76 | 7.70 | 2.66 | 0.08 | 0.17 | 29.7 | 35.7 |
| Cg3 | sicl | 19-26 | 5.2 | 1.3 | 0.06 | 13.2 | 8.9 | 17 | 7.17 | 3.97 | 0.09 | 0.16 | 24.8 | 45.9 |
| Cg4 | sicl | 26-36 | 5.2 | 1.0 | - | - | 17.7 | 62 | 8.72 | 5.54 | 0.13 | 0.20 | 25.1 | 58.1 |
| Cg5 | sil | 36+ | 5.7 | - | - | - | 13.9 | 97 | 7.90 | 5.49 | 0.13 | 0.23 | 20.0 | 68.8 |
| Westlang silty clay - Rego Humic Gleysol | | | | | | | | | | | | | | |
| Ap | sic | 0- 6 | 5.8 | 9.9 | 0.44 | 13.1 | 12.7 | 40 | 10.7 | 8.2 | 0.1 | 0.2 | 36.0 | 53.3 |
| CA | c | 6-14 | 5.8 | 4.3 | 0.17 | 15.0 | 12.6 | 35 | 14.1 | 9.4 | 0.1 | 0.2 | 37.6 | 63.2 |
| Cg1 | c | 14-23 | 6.0 | 3.2 | 0.12 | 16.0 | 6.3 | 17 | 13.9 | 12.5 | 0.2 | 0.4 | 36.2 | 74.5 |
| Cg2 | c | 23-34 | 6.0 | - | - | - | 3.5 | 7 | 9.0 | 10.3 | 0.1 | 0.2 | 28.6 | 68.5 |
| Cg3 | sil-sicl | 34+ | 5.8 | - | - | - | 2.5 | 9 | 7.0 | 4.9 | 0.1 | 0.3 | 22.4 | 54.9 |

Tr. - Trace

Table 6 - Chemical Analyses of Selected Composite Surface Samples of Langley Municipality.

| | | | | | | | Exchangeable Cations and Exchange Capacity me./100 gms. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
| Abbotsford Series - Orthic Concretionary Brown | | | | | | | | | | | | |
| 1 | 5.5 | 3.7 | 0.1 | 22.8 | > 100 | 200 | 2.03 | 0.47 | 0.26 | 0.09 | 14.4 | 19.8 |
| 2 | 5.3 | 6.5 | 0.2 | 24.1 | > 100 | > 300 | 3.02 | 0.47 | 0.60 | 0.10 | 23.6 | 17.8 |
| 3 | 5.4 | 6.5 | 0.2 | 24.1 | > 100 | 257 | 3.69 | 0.96 | 0.76 | 0.10 | 23.0 | 24.0 |
| Aldergrove Series - Orthic Acid Brown Wooded | | | | | | | | | | | | |
| 1 | 5.2 | 9.9 | 0.32 | 17.8 | 47.5 | 148 | 5.76 | 0.88 | 0.43 | 0.12 | 26.6 | 27.0 |
| 2 | 5.7 | 6.7 | 0.23 | 17.2 | 26.5 | 51 | 3.89 | 0.71 | 0.14 | 0.17 | 20.2 | 24.3 |
| 3 | 5.6 | 7.9 | 0.29 | 15.8 | 6.0 | 14 | 4.11 | 1.73 | 0.05 | 0.11 | 22.2 | 27.0 |
| Berry Series - Gleyed Orthic Acid Brown Wooded | | | | | | | | | | | | |
| 1 | 6.9 | 7.1 | 0.25 | 16.4 | 3.5 | 10 | 13.05 | 0.28 | 0.16 | 0.15 | 28.6 | 47.7 |
| 2 | 5.4 | 10.5 | 0.43 | 14.1 | 6.0 | 25 | 2.94 | 0.50 | 0.09 | 0.15 | 30.6 | 12.0 |
| Cloverdale Series - Humic Eluviated Gleysol | | | | | | | | | | | | |
| 1 | 5.2 | 9.1 | 0.41 | 12.7 | 9.0 | 16 | 4.86 | 1.75 | 0.16 | 0.25 | 27.9 | 25.2 |
| 2 | 5.5 | 8.7 | 0.43 | 11.8 | 49.0 | 125 | 9.45 | 2.20 | 0.29 | 0.21 | 36.1 | 33.7 |
| 3 | 5.1 | 9.7 | 0.50 | 12.0 | 6.8 | 10 | 3.51 | 1.78 | 0.14 | 0.34 | 35.3 | 16.3 |
| 4 | 4.9 | 10.9 | 0.50 | 13.5 | 33.7 | 46 | 3.60 | 1.52 | 0.16 | 0.25 | 33.2 | 16.7 |

Table 6 - continued

| | | | | | | | Exchangeable Cations and Exchange Capacity me./100 gms. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
| Columbia Series - Orthic Acid Brown Wooded | | | | | | | | | | | | |
| 1 | 6.4 | 10.6 | 0.33 | 18.5 | 23.5 | 81 | 16.08 | 0.36 | 0.24 | 0.08 | 24.4 | 68.7 |
| 2 | 5.3 | 8.1 | 0.22 | 21.5 | 96.0 | > 250 | 5.21 | 1.03 | 0.78 | 0.10 | 24.2 | 29.4 |
| 3 | 6.3 | 4.4 | 0.10 | 25.0 | 125.0 | > 250 | 5.80 | 2.99 | 0.31 | 0.06 | 13.6 | 67.4 |
| 4 | 5.5 | 4.3 | 0.12 | 20.2 | > 200.0 | > 500 | 2.54 | 1.66 | 0.52 | 0.05 | 16.0 | 29.8 |
| 5 | 5.1 | 4.1 | 0.14 | 16.6 | 189.0 | > 400 | 2.67 | 0.22 | 0.62 | 0.06 | 14.5 | 24.6 |
| Jackman Series - Rego Humic Gleysol | | | | | | | | | | | | |
| 1 | 5.2 | 8.3 | 0.39 | 12.5 | 25.0 | 38 | 6.30 | 2.00 | 0.16 | 0.21 | 32.3 | 26.8 |
| 2 | 5.0 | 7.5 | 0.30 | 14.6 | 37.0 | 57 | 5.36 | 0.56 | 0.09 | 0.10 | 23.7 | 25.8 |
| 3 | 5.3 | 8.4 | 0.25 | 19.5 | 26.0 | 48 | 3.49 | 0.39 | 0.05 | 0.15 | 22.0 | 18.6 |
| Langley Series - Humic Eluviated Gleysol | | | | | | | | | | | | |
| 1 | 5.0 | 20.5 | 0.80 | 14.3 | 30.7 | 50 | 9.26 | 1.83 | 0.22 | 0.49 | 49.5 | 23.8 |
| 2 | 5.7 | 19.9 | 0.70 | 15.1 | 27.0 | 49 | 20.62 | 1.81 | 0.26 | 0.28 | 52.3 | 43.9 |
| 3 | 4.7 | 17.5 | 0.80 | 12.9 | 7.0 | 10 | 2.72 | 1.63 | 0.26 | 0.54 | 45.0 | 11.4 |
| Livingstone Series - Rego Humic Gleysol | | | | | | | | | | | | |
| 1 | 5.0 | 13.8 | 0.6 | 13.1 | 20.6 | 30 | 4.79 | 1.36 | 0.11 | 0.22 | 35.0 | 18.5 |
| 2 | 4.8 | 13.5 | 0.7 | 11.0 | 20.3 | 30 | 4.85 | 1.82 | 0.20 | 0.24 | 39.2 | 18.1 |
| 3 | 5.2 | 11.7 | 0.56 | 12.0 | 23.0 | 37 | 5.12 | 0.83 | 0.15 | 0.21 | 30.6 | 20.6 |
| 4 | 5.0 | 11.8 | 0.57 | 12.0 | 45.5 | 71 | 3.89 | 0.59 | 0.08 | 0.17 | 26.8 | 17.7 |
| Lynden Series - Degraded Acid Brown Wooded | | | | | | | | | | | | |
| 1 | 5.9 | 4.4 | 0.13 | 18.9 | 80.0 | 197 | 1.80 | 0.49 | 0.24 | 0.06 | 13.0 | 19.9 |
| 2 | 5.5 | 4.7 | 0.13 | 20.5 | 83.0 | 215 | 1.60 | 0.30 | 0.13 | 0.06 | 13.2 | 15.8 |

Table 6 - continued

| Sample Number | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Exchangeable Cations and Exchange Capacity me./100 gms. Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Marble Hill Series - Orthic Acid Brown Wooded | | | | | | | | | | | | |
| 1 | 4.7 | 8.3 | 0.3 | 17.0 | > 100 | > 300 | 2.77 | 0.14 | 0.39 | 0.10 | 24.6 | 13.8 |
| 2 | 5.3 | 9.1 | 0.3 | 17.3 | 92 | 220 | 4.09 | 0.30 | 0.11 | 0.15 | 25.2 | 18.5 |
| Milner Series - Orthic Concretionary Brown | | | | | | | | | | | | |
| 1 | 5.3 | 9.7 | 0.40 | 15.1 | 52.7 | 76 | 4.24 | 1.14 | 0.27 | 0.14 | 32.2 | 18.0 |
| 2 | 5.0 | 12.0 | 0.50 | 14.8 | 35.3 | 72 | 2.63 | 1.89 | 0.36 | 0.11 | 33.3 | 15.0 |
| 3 | 4.9 | 10.7 | 0.40 | 14.5 | 32.1 | 57 | 5.84 | 2.23 | 0.49 | 0.20 | 39.6 | 22.1 |
| Murrayville Series - Orthic Acid Brown Wooded | | | | | | | | | | | | |
| 1 | 5.5 | 10.0 | 0.30 | 16.0 | 13.7 | 38 | 7.96 | 0.47 | 0.29 | 0.22 | 28.8 | 31.0 |
| 2 | 5.5 | 10.0 | 0.40 | 16.0 | 60.5 | 98 | 6.29 | 0.52 | 0.32 | 0.13 | 22.7 | 32.0 |
| Nicholson Series - Orthic Concretionary Brown | | | | | | | | | | | | |
| 1 | 5.8 | 6.2 | 0.18 | 20.3 | 10.0 | 34 | 4.24 | 0.70 | 0.19 | 0.14 | 19.1 | 27.6 |
| 2 | 5.6 | 7.5 | 0.24 | 17.9 | 27.0 | 80 | 5.38 | 1.36 | 0.31 | 0.14 | 29.8 | 24.1 |
| 3 | 5.4 | 6.4 | 0.19 | 19.7 | 14.5 | 53 | 2.24 | 0.08 | 0.14 | 0.08 | 18.8 | 13.5 |
| Scat Series - Rego Humic Gleysol | | | | | | | | | | | | |
| 1 | 5.4 | 11.7 | 0.49 | 13.7 | 23.5 | 51 | 8.37 | 1.83 | 0.22 | 0.24 | 34.7 | 30.7 |
| 2 | 6.0 | 13.5 | 0.46 | 16.9 | 50.0 | 111 | 18.55 | 2.46 | 0.80 | 0.20 | 38.6 | 57.0 |
| 3 | 5.6 | 11.2 | 0.51 | 12.8 | 43.5 | 84 | 10.98 | 3.96 | 0.37 | 0.31 | 42.7 | 36.6 |

Table 6 - continued

| Sample Number | pH | Organic Matter % | Total Nitrogen % | C-N Ratio | $P_1$ ppm. | $P_2$ ppm. | Exchangeable Cations and Exchange Capacity me./100 gms. Ca | Mg | K | Na | Cation Exchange Capacity | Base Saturation % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Whatcom Series - Orthic Acid Brown Wooded | | | | | | | | | | | | |
| 1 | 5.9 | 6.4 | 0.21 | 17.9 | 13.5 | 31 | 7.01 | 0.66 | 0.15 | 0.10 | 20.0 | 39.6 |
| 2 | 5.9 | 7.6 | 0.29 | 15.1 | 35.5 | 110 | 10.97 | 0.69 | 0.16 | 0.12 | 25.9 | 46.0 |
| 3 | 5.6 | 7.3 | 0.26 | 16.3 | 9.0 | 33 | 4.60 | 0.57 | 0.26 | 0.09 | 18.5 | 29.8 |
| 4 | 5.4 | 6.7 | 0.23 | 17.0 | 14.0 | 48 | 3.24 | 0.53 | 0.16 | 0.09 | 22.8 | 17.6 |
| 5 | 5.7 | 9.5 | 0.32 | 16.9 | 18.5 | 81 | 7.51 | 0.59 | 0.29 | 0.09 | 27.6 | 30.7 |

$>$ - Greater than

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## APPENDIX

Table A - Average Monthly, Annual Mean and Extreme Temperatures Recorded at Several Fraser Valley Stations (5).

Degrees Fahrenheit

| Station | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Annual | High | Low | Years of Record |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Steveston | 36 | 38 | 42 | 48 | 54 | 59 | 62 | 62 | 57 | 50 | 42 | 39 | 49 | 92 | - 5 | 66 |
| Vancouver (Airport) | 36 | 39 | 43 | 49 | 55 | 59 | 64 | 63 | 58 | 50 | 43 | 39 | 50 | 92 | 0 | 24 |
| New Westminster | 36 | 39 | 43 | 50 | 56 | 60 | 64 | 64 | 59 | 51 | 43 | 39 | 51 | 99 | - 2 | 75 |
| Langley (Lochiel) | 38 | 41 | 43 | 48 | 54 | 59 | 64 | 63 | 57 | 50 | 42 | 39 | 50 | 96 | 9 | 6 |
| Stave Falls | 36 | 38 | 42 | 49 | 55 | 60 | 64 | 64 | 59 | 51 | 42 | 38 | 50 | 104 | -16 | 53 |
| Haney (U.B.C. Forest) | 33 | 37 | 40 | 46 | 54 | 57 | 62 | 61 | 57 | 48 | 40 | 36 | 48 | 99 | - 5 | 15 |
| Abbotsford (Airport) | 34 | 38 | 42 | 58 | 54 | 59 | 62 | 62 | 58 | 50 | 42 | 38 | 49 | 100 | - 6 | 18 |
| Mission | 36 | 39 | 42 | 49 | 55 | 59 | 64 | 63 | 58 | 51 | 43 | 39 | 50 | 100 | 6 | 10 |
| Chilliwack | 34 | 39 | 41 | 49 | 55 | 60 | 64 | 63 | 60 | 52 | 43 | 39 | 50 | 100 | 0 | 13 |
| Agassiz | 35 | 39 | 43 | 50 | 56 | 60 | 64 | 64 | 60 | 52 | 43 | 38 | 50 | 103 | -13 | 73 |
| Hope (Town) | 31 | 37 | 42 | 50 | 56 | 60 | 65 | 65 | 61 | 51 | 41 | 36 | 50 | 104 | - 9 | 23 |

Table B - Monthly, Annual and Growing Season Precipitation at Aldergrove (5).

Elevation 275 feet

Inches

| | | | | | | | | | | | | | | Growing Season (May-September) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Annual | Total | Average per Month |
| 1953 | - | - | - | 4.29 | 1.88 | 3.90 | 2.13 | 1.22 | 5.42 | 5.95 | 12.01 | 13.16 | - | 14.55 | 2.91 |
| 1954 | 10.82 | 7.38 | 3.09 | 4.77 | 2.22 | 3.93 | 1.78 | 3.71 | 3.07 | 2.73* | 15.12* | 7.42* | 66.04 | 14.71 | 2.94 |
| 1955 | 5.08 | 5.05 | 5.94 | 4.54 | 4.01 | 2.96 | 3.55* | 0.17* | 1.92 | 8.82 | 12.72 | 8.07 | 62.83 | 12.61 | 2.52 |
| 1956 | 7.27 | 6.42 | 6.37 | 0.80* | 1.41* | 6.14* | 0.60 | 1.71 | 6.85 | 11.29* | 3.74* | 13.68* | 66.28 | 16.71 | 3.34 |
| 1957 | 3.88* | 5.16 | 7.55 | 3.94 | 1.74 | 2.28 | 2.07 | 2.40 | 1.13* | 3.36 | 4.71 | 7.76 | 45.98* | 9.62 | 1.92 |
| 1958 | 11.51 | 6.25 | 2.40* | 3.85 | 2.22 | 0.70* | 0.41* | 1.74 | 2.67 | 7.08 | 9.01 | 9.53 | 57.37 | 7.74* | 1.55* |
| 1959 | 9.85 | 6.35 | 8.32* | 6.53* | 4.13* | 3.03 | 1.34 | 1.60 | 7.98* | 5.86 | 9.41 | 8.82 | 73.20* | 18.08* | 3.62* |
| 1960 | 8.15 | 6.01 | 5.69 | 4.12 | 2.98 | 3.19 | 1.49 | 2.09 | 3.89 | 6.72 | 9.23 | 9.31 | 62.87 | 13.64 | 2.73 |
| 1961 | 11.93* | 13.62* | 7.85 | 3.26 | 4.02 | 1.54 | 0.96 | 2.63 | 1.90 | 8.47 | 6.24 | 10.27 | 72.69 | 11.05 | 2.21 |
| 1962 | 9.21 | 3.29* | 4.99 | 5.68 | 3.36 | 2.37 | 1.31 | 5.01* | 4.63 | 4.97 | 10.42 | 9.98 | 65.22 | 16.68 | 3.34 |
| *High | 11.93 | 13.62 | 8.32 | 6.53 | 4.13 | 6.14 | 3.55 | 5.01 | 7.98 | 11.29 | 15.12 | 13.68 | 73.20 | 18.08 | 3.62 |
| *Low | 3.88 | 3.29 | 2.40 | 0.80 | 1.41 | 0.70 | 0.41 | 0.17 | 1.13 | 2.73 | 3.74 | 7.42 | 45.98 | 7.74 | 1.55 |

Table C - Monthly, Annual and Growing Season Precipitation at Abbotsford Airport (5).

Elevation 198 feet

Inches

| | | | | | | | | | | | | | | Growing Season (May-September) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Annual | Total | Average per Month |
| 1951 | 11.55 | 12.37 | 8.39* | 2.02 | 3.28 | 0.93 | 0.11 | 0.63 | 3.12 | 7.27 | 5.48 | 6.74 | 61.89 | 8.07 | 1.61 |
| 1952 | 4.81 | 3.93 | 4.43 | 3.50 | 2.82 | 3.32 | 0.93 | 0.88 | 1.78* | 2.04* | 1.33* | 7.73 | 37.50* | 9.73 | 1.95 |
| 1953 | 17.36* | 4.57 | 5.44 | 4.09 | 2.04 | 4.52 | 1.69 | 1.07 | 3.65 | 7.47 | 10.79 | 12.41* | 75.10* | 12.97 | 2.59 |
| 1954 | 10.27 | 5.71 | 2.66 | 4.59 | 2.57 | 3.95 | 1.25 | 3.68 | 2.16 | 2.41 | 14.52* | 6.16 | 59.93 | 13.61 | 2.72 |
| 1955 | 4.10* | 5.67 | 5.14 | 5.59 | 4.80 | 2.39 | 2.38* | 0.24* | 1.93 | 8.66* | 10.39 | 8.17 | 59.46 | 11.74 | 2.35 |
| 1956 | - | - | - | 1.12* | 1.65 | 6.38* | 0.43 | 1.56 | 7.07* | - | - | - | - | 17.09 | 3.42 |
| 1957 | 5.46 | 5.00 | 4.71 | 4.31 | 3.79 | 3.53 | 1.59 | 1.68 | 3.58 | 5.04 | 7.56 | 7.71 | 54.00 | 14.17 | 1.83 |
| 1958 | 10.90 | 7.19 | 2.15* | 4.53 | 1.54* | 0.81* | 0.02 | 1.73 | 3.05 | 7.26 | 8.80 | 8.35 | 56.33 | 7.15* | 1.43* |
| 1959 | 9.32 | 5.69 | 6.74 | 6.15* | 3.22 | 2.82 | 1.04 | 2.19 | 6.03 | 5.48 | 7.72 | 8.10 | 64.50 | 15.34 | 3.07 |
| 1960 | 7.50 | 4.88 | 5.36 | 3.22 | 7.85* | 3.22 | Tr. * | 3.70 | 2.08 | 8.38 | 6.64 | 5.63* | 58.46 | 16.85 | 3.37 |
| 1961 | 8.46 | 12.71* | 6.79 | 3.12 | 4.08 | 1.08 | 0.79 | 2.00 | 1.99 | 8.30 | 5.32 | 8.71 | 63.35 | 9.94 | 1.99 |
| 1962 | 6.79 | 3.27* | 4.77 | 4.39 | 3.74 | 1.70 | 1.09 | 6.17* | 4.49 | 3.37 | 8.44 | 9.11 | 57.33 | 17.19* | 3.44* |
| *High | 17.36 | 12.71 | 8.39 | 6.15 | 7.85 | 6.38 | 2.38 | 6.17 | 7.07 | 8.66 | 14.52 | 12.41 | 75.10 | 17.19 | 3.44 |
| *Low | 4.10 | 3.27 | 2.15 | 1.12 | 1.54 | 0.81 | Tr. | 0.24 | 1.78 | 2.04 | 1.33 | 5.63 | 37.50 | 7.15 | 1.43 |

Table D - Monthly, Annual and Growing Season Precipitation at Fort Langley and Langley (Lochiel) (5).

Inches

| Year | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Annual | Growing Season (May-September) Total | Growing Season (May-September) Average per Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fort Langley - Elevation 20 feet | | | | | | | | | | | | | | | |
| 1953 | - | - | - | 3.26 | 2.38 | 4.83 | 1.39 | 1.79 | 4.99 | 6.16 | 11.15 | 14.89 | - | 15.38 | 3.08 |
| 1954 | 11.16 | 6.59 | 2.12 | 4.91 | 2.96 | 4.16 | 1.84 | 4.11 | 2.75 | 2.95 | 14.00 | 6.34 | 63.89 | 15.82 | 3.16 |
| 1955 | 4.66 | 3.90 | 6.39 | 3.44 | 2.62 | 3.07 | 3.46 | 0.00 | 1.34 | 7.94 | 12.65 | 11.13 | 60.60 | 10.49 | 2.10 |
| 1956 | 8.76 | 6.91 | 5.73 | 0.42 | 0.79 | - | 0.77 | - | - | - | - | - | - | - | - |
| Langley (Lochiel) - Elevation 345 feet | | | | | | | | | | | | | | | |
| 1957 | - | - | 7.14* | 3.79 | 1.42* | 2.36 | 2.19* | 2.40 | 1.28* | 3.28* | 4.73* | 8.10 | - | 9.65 | 1.93 |
| 1958 | 10.76* | 5.42 | 2.07* | 3.79 | 2.25 | 0.84* | 0.33 | 1.56 | 2.26 | 6.28 | 8.44 | 8.64 | 52.64* | 7.24* | 1.45* |
| 1959 | 8.79 | 6.14 | 6.83 | 5.94* | 3.13 | 2.97* | 0.53 | 0.75* | 7.08* | 4.87 | 8.67 | 8.25 | 63.95 | 14.46 | 2.89 |
| 1960 | 7.20 | 5.30 | 4.81 | 3.43 | 5.61* | 1.43 | 0.00* | 4.46 | 1.68 | 7.81 | 6.86 | 5.53* | 54.12 | 13.18 | 2.64 |
| 1961 | 9.81 | 13.38* | 6.78 | 3.02* | 3.51 | 1.06 | 1.00 | 2.57 | 1.37 | 8.74* | 5.53 | 9.15* | 65.92* | 9.51 | 1.90 |
| 1962 | 6.94* | 3.12* | 4.03 | 4.89 | 2.93 | 1.75 | 1.01 | 7.60* | 3.44 | 4.03 | 9.24* | 8.56 | 57.54 | 16.73* | 3.35* |
| *High | 10.76 | 13.38 | 7.14 | 5.94 | 5.61 | 2.97 | 2.19 | 7.60 | 7.08 | 8.74 | 9.24 | 9.15 | 65.92 | 16.73 | 3.35 |
| *Low | 6.94 | 3.12 | 2.07 | 3.02 | 1.42 | 0.84 | 0.00 | 0.75 | 1.28 | 3.28 | 4.73 | 5.53 | 52.64 | 7.24 | 1.45 |

Table E - Monthly, Annual and Growing Season Precipitation at Langley Prairie (5).

Elevation 285 feet

Inches

| Year | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Annual | Growing Season (May-September) Total | Growing Season (May-September) Average per Month |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1953 | - | - | - | 3.11 | 1.72 | 3.86 | 1.97 | 1.04 | 5.43 | 5.90 | 11.92 | 12.72 | - | 14.02 | 2.80 |
| 1954 | 10.22 | 5.92 | 2.11* | 4.12 | 2.28 | 3.76 | 1.50 | 3.24 | 3.03 | 2.63* | 14.35* | 6.17 | 59.33 | 13.81 | 2.76 |
| 1955 | 4.99 | 5.14 | 5.43 | 3.71 | 3.29 | 2.69 | 3.48* | 0.18* | 1.88 | 7.91 | 12.86 | 6.49 | 58.05 | 11.52 | 2.30 |
| 1956 | 7.49 | 5.44 | 6.21 | 0.74* | 1.04* | 5.74* | 0.75 | 2.14 | 6.88 | 9.82* | 3.88* | 13.40* | 63.53 | 16.55* | 3.31* |
| 1957 | 3.45* | 4.31 | 6.28 | 3.32 | 1.36 | 2.98 | 2.08 | 2.16 | 1.39 | 4.24 | 4.40 | 7.89 | 43.86* | 9.97 | 1.99 |
| 1958 | 10.63 | 5.61 | 2.23 | 3.14 | 2.74 | 0.77* | 0.13 | 1.62 | 2.10 | 6.96 | 8.08 | 8.19 | 52.20 | 7.36* | 1.47* |
| 1959 | 8.43 | 7.06 | 7.43* | 5.51* | 3.64 | 3.17 | 0.91 | 1.00 | 7.61* | 5.17 | 9.54 | 7.81 | 67.28* | 16.33 | 3.27 |
| 1960 | 8.49 | 5.23 | 5.63 | 3.47 | 5.93* | 2.13 | 0.00* | 4.91 | 2.18 | 7.43 | 6.70 | 5.69* | 57.79 | 15.15 | 3.03 |
| 1961 | 11.46* | 13.49* | 5.92 | 3.32 | 3.65 | 1.30 | 0.71 | 2.47 | 1.05* | 8.86 | 5.64 | 9.14 | 67.01 | 9.18 | 1.83 |
| 1962 | 7.52 | 3.32* | 4.26 | 5.00 | 3.82 | 2.22 | 1.46 | 5.03* | 3.71 | 4.38 | 10.04 | 10.34 | 61.10 | 16.24 | 3.25 |
| *High | 11.46 | 13.49 | 7.43 | 5.51 | 5.93 | 5.74 | 3.48 | 5.03 | 7.61 | 9.82 | 14.35 | 13.40 | 67.28 | 16.55 | 3.31 |
| *Low | 3.45 | 3.32 | 2.11 | 0.74 | 1.04 | 0.77 | 0.00 | 0.18 | 1.05 | 2.63 | 3.88 | 5.69 | 43.86 | 7.36 | 1.47 |

Table F - Spring and Fall Frosts and Duration of Frost-Free Period for Several Fraser Valley Stations (10).

| Station | Last Frost in Spring | | | First Frost in Autumn | | | Average Frost-Free Period (Days) | Years of Record |
|---|---|---|---|---|---|---|---|---|
| | Mean | Earliest | Latest | Mean | Earliest | Latest | | |
| Steveston | April 15 | March 7 | May 19 | Oct. 19 | Sept. 23 | Nov. 18 | 187 | 50 |
| Vancouver | March 31 | Dec. 31 | April 30 | Nov. 5 | Sept. 23 | Dec. 5 | 219 | 45 |
| Stave Falls | April 10 | Feb. 23 | May 8 | Oct. 26 | Sept. 22 | Nov. 23 | 199 | 37 |
| Matsqui | April 25 | March 22 | May 31 | Oct. 20 | Sept. 11 | Nov. 19 | 178 | 24 |
| North Nicomen | April 17 | March 9 | May 15 | Oct. 29 | Sept. 23 | Dec. 5 | 195 | 34 |
| Chilliwack | April 20 | March 13 | May 24 | Oct. 21 | Sept. 24 | Dec. 8 | 184 | 32 |
| Agassiz | April 14 | Feb. 25 | May 24 | Oct. 29 | Sept. 8 | Dec. 24 | 198 | 50 |

Table G - Average Monthly and Annual Snowfall for Several Fraser Valley Stations (5).

Inches

| Station | Jan. | Feb. | March | April | May | June - Sept. | Oct. | Nov. | Dec. | Annual | Years of Record |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Steveston | 6.5 | 3.6 | 1.7 | 0.1 | - | - | - | 1.3 | 2.7 | 15.9 | 60 |
| Vancouver (City Hall) | 5.1 | 3.8 | 0.9 | Trace | - | - | - | 1.0 | 2.6 | 13.4 | 41 |
| New Westminster | 11.7 | 10.1 | 3.2 | 0.2 | - | - | Trace | 3.4 | 4.4 | 33.0 | 62 |
| Langley Prairie | 21.3 | 5.5 | 1.7 | - | - | - | - | 1.8 | 1.0 | 31.3 | 4 |
| Stave Falls | 9.7 | 5.6 | 2.9 | - | - | - | Trace | 1.1 | 4.2 | 23.5 | 46 |
| Haney | 23.4 | 11.0 | 12.3 | 2.0 | 0.1 | - | - | 2.1 | 9.4 | 60.3 | 10 |
| Aldergrove | 23.6 | 8.9 | 5.0 | Trace | - | - | Trace | 3.2 | 6.6 | 47.3 | 4 |
| Abbotsford (Airport) | 11.8 | 5.1 | 5.0 | 0.3 | - | - | Trace | 2.1 | 5.7 | 30.0 | 11 |
| Mission | 11.5 | 5.8 | 4.5 | - | - | - | - | 1.9 | 2.4 | 26.1 | 4 |
| Chilliwack (Sardis) | 13.8 | 6.1 | 3.4 | 0.3 | Trace | - | 0.1 | 3.7 | 6.4 | 33.8 | 56 |
| Agassiz | 13.5 | 9.9 | 4.0 | 0.3 | 0.1 | - | - | 3.1 | 7.6 | 38.5 | 66 |
| Hope (Town) | 21.0 | 11.8 | 2.6 | 0.3 | - | - | - | 3.4 | 12.4 | 51.5 | 18 |

## GLOSSARY

Aeolian deposits - Geological materials transported and deposited by wind action.

Aggregate (soil) - A single mass or cluster of soil consisting of many soil particles held together as a prism, granule or other form.

Alluvium - All materials moved and deposited by flowing water. Soils derived from alluvium are called alluvial soils.

Anthropic - A general term meaning man-made. It refers to soil altered by man.

Available plant nutrients - Nutrients in the soil in condition to be taken up by plant roots.

Base saturation percentage - The percentage of the total cation exchange capacity of the soil which is satisfied by cations other than hydrogen.

Cation exchange capacity - The adsorptive capacity of soil for cations or the amount of cations that can be adsorbed by a stated quantity of soil, usually expressed as milli-equivalents per 100 grams of soil.

Cementation - Brittle, hard consistence caused by some cementing agent other than clay minerals. Typical cementing substances are calcium carbonate, silica and the oxides of iron and aluminum.

Cobble - A fragment of rock three to ten inches in diameter.

Concretions - Hard concentrations of soil cemented by certain chemical compounds into aggregates or nodules of various shapes and sizes.

Consistence - The mutual attraction of particles in a soil mass or their resistance to separation or deformation.

Delta - An alluvial deposit at the mouth of a river or stream, more or less triangular in shape.

Dry-farming - Farming without irrigation, particularly in areas where rainfall in the growing season is not adequate for optimum crop production.

Eluvial horizon - A soil horizon from which material has been removed in solution or water suspension.

Floodplain - A river or stream deposit subject to overflow. A floodplain is characterized by a series of lateral accretions near the river channel and a gentle downslope to a swampy inner margin.

Friable - A term referring to a moist soil aggregate easily crushed between the fingers but which coheres when pressed together.

Glacial drift - All material transported and deposited by glaciers or by streams issuing from glaciers and includes glacial till and glacial outwash.

Glacial outwash - All material eroded from glaciers by melt-water which is sorted and deposited beyond the ice-front.

Glacial till - An unsorted, unconsolidated, heterogeneous mixture of stones, gravel, sand, silt, and clay deposited by glaciers.

Glaciomarine deposits - Materials deposited in the sea by glaciers.

Gley - A process in which the soil material has been modified by chemical reduction brought about by saturation with water for long periods in the presence of organic matter.

Gravel - Rounded and subrounded rock fragments up to three inches in diameter.

Horizon - A layer in the soil profile approximately parallel to the land surface with more or less well defined characteristics produced through the operation of the soil forming processes. Horizon boundaries are described as abrupt if less than one inch wide, clear if from one to two and one-half inches, gradual if two and one-half to five inches, and diffuse if more than five inches in depth.

Horizon nomenclature - Capital and lower case letters used to designate horizons in this report are as follows:

Organic Horizons:

L - An organic layer characterized by the accumulation of organic matter in which the original structures are easily discernible.

F - An organic layer characterized by the accumulation of partly decomposed organic material. The original structures are discernible with difficulty.

H - An organic layer characterized by an accumulation of decomposed organic matter in which the original structures are undiscernible.

Master Mineral Horizons:

A - A mineral horizon or horizons formed at or near the soil surface in the zone of maximum removal of materials in solution and suspension and/or maximum in situ accumulation of organic matter. It includes: (1) horizons in which organic matter has accumulated as a result of biological activity (Ah); (2) horizons that have been eluviated of clay, iron, aluminum and/or organic matter (Ae); (3) horizons dominated by (1) and (2) but transitional to underlying B or C horizons (AB or A and B); (4) horizons markedly disturbed by cultivation or pasture (Ap).

B - A mineral soil horizon or horizons characterized by one or more of the following: (1) an enrichment in silicate clay, iron, aluminum and/or illuvial organic matter (Bt, Bf, Bh, Bfh); a prismatic or columnar structure which exhibits pronounced coatings or stainings and characterized by the presence of significant amounts of exchangeable sodium and/or magnesium (Bn); an alteration by hydrolysis or oxidation to give a change in colour and/or structure but does not meet the requirements of (1) and (2) above (Bm).

C - A mineral horizon or horizons comparatively unaffected by the pedogenic processes operative in A and B, excepting (1) the process of gleying and (2) the accumulation of dolomite and salts more soluble in water (Cca, Csa, Cg, and C).

Lower Case Suffixes:

c - A cemented (irreversible) pedogenic horizon.

cc - Cemented (irreversible) pedogenic concretions.

e - A horizon characterized by the removal of clay, iron, aluminum, or organic matter and lighter in colour than the horizon below.

f - A horizon enriched with hydrated iron and redder in colour than either the horizon above or below.

g - A horizon characterized by reduction and gray colours; often mottled (gley).

h - A horizon enriched with organic matter.

j - A horizon whose characteristics are weakly expressed. It must be used with some other suffix.

m - A horizon slightly altered by hydrolysis, oxidation and/or solution to give a change in colour and/or structure (mellowed).

p - A layer disturbed by man's activities, i.e., cultivation and/or pasturing. To be used only with A.

t - A horizon enriched with silicate clay (ton).

Additional Terms:

(1) Lithologic changes are indicated by Roman numeral prefixes (II, III, with I assumed).

(2) Horizon subdivisions are by numbers as prefixes, i.e., Ap1, Ap2.

(3) If more than one lower case suffix is required and if one only is a weak expression, then the j is to be linked to that suffix with a bar, e.g., $Bf\overline{cj}$.

Humus - The well decomposed, more or less stable part of the soil organic matter.

Impervious material - Materials resistant to penetration by water, air and roots.

Illuvial horizon - A horizon in which material from another part of the soil profile has accumulated.

Lateral accretion - Deposit in which fine sands and silts are deposited horizontally near river margins by drifting along the bottom during freshet overflow.

Leaching - Removal of soluble constituents from the soil by percolating water.

Levee - A natural embankment along a river channel on a floodplain.

Littoral - Of or pertaining to the seashore. A coastal region.

Loess - Silty and very fine sand material blown and deposited by wind.

Mottled - Irregular spots or streaks of different colours in soils which indicate chemical oxidation and reduction caused by a fluctuating water table.

Muck - Fairly well decomposed organic soil containing 30 percent or more of organic matter.

Orthic - A term used to define the subgroup of soils considered to be the central concept of a great soil group. Other subgroups are departures from the Orthic.

Parent material - The unconsolidated geological material from which the solum of a soil develops.

Peat - Undecomposed to partly decomposed organic material with recognizable plant remains which accumulated under very poor drainage.

Percolation - Downward movement of water through the soil.

Permeability - The quality or state of a soil or of any horizon in the soil profile that permits passage of water or air to all parts of the mass.

pH - A logarithmic designation of the relative acidity or alkalinity of soil or other materials.

Plant nutrients - The elements taken in by a plant which are essential to its growth and used by it in the elaboration of its food and tissue.

Plastic - Capable of being molded or modeled without rupture when moist.

Porosity - That part of the total soil volume not occupied by soil particles.

Profile - A vertical section of the soil through all horizons and extending into the parent material.

Soil drainage - The frequency and duration of periods when the soil is free of water saturation. The following drainage classes are used in this report:

Rapidlty drained - Soil moisture seldom exceeds field capacity in any horizon except immediately after water additions.

Well drained - Soil moisture in excess of field capacity does not remain in any horizon (except possibly the C) for a significant part of the year.

Moderately well drained - Soil moisture in excess of field capacity remains for a small but significant period of the year.

Imperfectly drained - Soil moisture in excess of field capacity remains in subsurface horizons for moderately long periods during the year.

Poorly drained - Soil moisture in excess of field capacity remains in all horizons for a large part of the year.

Very poorly drained - Free water remains at or within 12 inches of the surface most of the year.

Soil structure - The morphological aggregates in which individual soil particles are arranged. The following soil structure descriptions are used in this report:

Platy - Thin, horizontal plates; the horizontal axis is longer than the vertical one.

Prismatic - Large aggregates with vertical axes longer than the horizontal and with well defined surfaces and edges. The tops are usually flat.

Blocky - Block-like aggregates; the vertical and horizontal axes about the same length, usually with sharp edges.

Subangular blocky - Block-like aggregates with vertical and horizontal axes about the same length, usually with subrounded edges.

Granular - More or less rounded aggregates with an absence of smooth faces and edges.

Massive - A cohesive soil mass with no observable aggregation of soil particles.

Single-grain - A loose, incoherent mass of individual particles, as in sand.

Solum - The part of the soil profile above the parent material in which soil development is taking place. The A and B horizons.

Stones - Rock fragments over 10 inches but less than two feet in diameter.

Stratified - Composed or arranged in strata or layers.

Texture - The composition of the soil based on the amount of sand, silt and clay present. Sand consists of particles which range in size from 2.0 to 0.5 mm., silt from 0.5 to 0.002 mm., while clay consists of all particles less than .002 mm.

Topography - The surface features, or a description of the surface features, of a place. The following symbols were used to denote topography in this report:

| Simple Topography Single Slopes (Regular Surface) | | Complex Topography Multiple Slopes (Irregular Surface) | Slope % |
|---|---|---|---|
| A | depressional to level | a | 0 - 0.5 |
| B | very gently sloping | b | 0.5- 2 |
| C | gently sloping | c | 2 - 5 |
| D | moderately sloping | d | 6 - 9 |
| E | strongly sloping | e | 10 -15 |
| F | steeply sloping | f | 16 -30 |
| G | very steeply sloping | g | 30 -60 |
| H | extremely sloping | h | Over 60 |

Vertical accretion - Sediments that settle from water in ponds on the floodplain in the freshet season.

Water holding capacity - The amount of water held in a soil after excess gravity water has drained away.

Water table - The upper limit of that part of the soil or underlying material wholly saturated with water.

Weathering - The physical and chemical disintegration and decomposition of rocks and minerals.